BRITISH RAILWAYS IN BOOM AND DEPRESSION

AN ESSAY IN

TRADE FLUCTUATIONS AND THEIR EFFECTS

1878—1930

by

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TO

MY MOTHER

PREFACE

THE present essay summarises part of a much more substantial doctoral dissertation. In view of the topical nature of the problem which it discussed and the impossibility of reproducing the larger work in a readable form, I have been persuaded to select those parts which are likely to be of more immediate interest and cast them into print. On reading over the manuscript, however, I feel that much may have been lost by condensation, though it is too much to expect the busy reader to delve into dull refinements of detail which are of interest only to the author himself. Nevertheless, if the technician finds the treatment too sketchy, he is sure of my apologies.

Apology to the reader must be followed by acknowledgment to those who enabled the larger work to proceed. Some of the study dates back several years, whilst I was a member of the Economics staff at Manchester University, but that concerned with American conditions was only made possible by means of a year spent in the United States, as a Fellow of the Rockefeller Foundation, to which body and its administrative organ, the Social Science Research Council, special thanks are due.

It is often impossible, of course, to trace one's turns of thought to specific persons, and extremely painful to be invidious by the mention of names. I have had occasion to trouble numerous academic and business authorities for opinions and information. More direct acknowledgment is due, however, to the following:—

Mr. C. E. R. Sherrington, Secretary of the Railway Research Service, among other things for generous and detailed criticism of tentative papers already published on the subject, and assistance in meeting authorities in the railway field;

Messrs. M. O. Lorenz (Interstate Commerce Commission) and J. Parmalee (Bureau of Railway

Economics) for information, statistical and otherwise, drawn from their official sources;

Professor T. H. Brown, and Messrs. R. F. Bingham, D. B. Leavens, and V. A. Temnomeroff (Harvard University) for help in connection with statistical manipulation;

Professors W. J. Cunningham and C. O. Ruggles (Harvard University), W. M. Daniels and K. T. Healy (Yale University), and L. C. Sorrell (Chicago University) for time devoted to discussion of the broad problem;

Mr. W. T. Stephenson (London School of Economics) for a brief letter, which turned my thoughts to the effects of trade fluctuations on the rate level;

Sir Josiah Stamp, who read the larger work, for offering many suggestions and criticisms which I have endeavoured to use;

Professor G. W. Daniels (Manchester University) for criticism and assistance throughout.

There are others who may discover reproduction of their hints in the pages which follow, and if I include them in my general thanks it is not from ingratitude, but because their suggestions have become so much a part of my mental make-up that I cannot trace their origin.

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IN BOOM · AND DEPRESSION

THE PROBLEM OF FLUCTUATIONS

EXPLANATIONS are among the most unfortunate of
necessities with which any discussion may begin, but,
though it may savour of the pedantic to insist on a
preliminary statement of data, scope, and method, there
is at least some value in knowing the exact purpose which
lies behind any piece of work. Given a problem definite
in character, the investigator has a guide through the
wealth of detail which inevitably crowds upon him; he is
able to select, and to economise in the exercise of selec-
tion; to relate and test all his facts by reference solely
to the end which he has in view; and to keep his work
consistently in such a form that each point is linked to
the next in orderly sequence.

I begin, therefore, with the fact that railways are
public utilities, in the sense that they constitute an
industry "affected with a public interest," and subject
to control through duly appointed agencies. They are,
moreover, the biggest of British public utilities.

Of the chief dynamic problems which face commis-
sions, tribunals, and committees, few seem so important
at the present time as the alternate recurrence of periods
of good and bad trade. It is usually assumed by those
who are interested in the business cycle that its reactions
are more or less the same in all industries, public utilities
included. But, among competent British publicists, there
appears to be some disagreement in regard to railways.
Of modern analysts, Messrs. C. E. R. Sherrington and
W. V. Wood may be said to represent one type of state-

ment. In a valuable contribution to the study of present railway conditions they generalise as follows:[1]—

A railway's prosperity must depend directly upon the prosperity of the territory which it serves; trade depressions will be reflected automatically in losses of traffic, in the case of freight through the reduced volume of trade, and also in the case of passenger traffic, owing to the decreased purchasing power of the community it serves.

The railway industry is notable for the very large percentage of its revenue expenditure which is of a fixed nature, varying, as to a large percentage comparatively little, and to an important percentage not at all, in proportion to increases or decreases in the volume of traffic. Hence any reduction in gross revenue cannot be . offset by a similar decrease in expenditure, and a trade depression existing in its area is likely to be felt more than proportionately by the railway which serves it.

It should be stated of their generalisation that they are using the experience of the great post-war depression as the basis for the statement, regardless of pre-war results, and, in so doing, they restrict the size of the sample. What may be true of this extremely peculiar period, however, may not have been true of the earlier past, though, even then, it does not follow that the statement will not be true of the future. The authors are, moreover, thinking in terms of static economics. These are certainly applicable in a rough way to the period since 1921, when price movements have not been able to obscure the resultant tendencies, though it is questionable whether they carried very far in the twenty years immediately before the war.

In contradistinction to this point of view is that put forward by Sir Josiah Stamp, in a pioneer investigation into the effects of trade fluctuations on profits.[2] Sir Josiah Stamp set himself the task of answering the question whether there are "any factors to which railway profits are related." Assuming, on account of stability

[1] *The Railway Industry of Great Britain*, Memo. Rl. Econ. Soc., No. 11,. January 1929, p. 3.

[2] "The Effect of Trade Fluctuations on Profits," *Jnl. Rl. Stat. Soc.*, 1918. Vol. LXXXI, p. 581 et seq.

of rates, that "gross receipts correspond to what we should call in other industries 'output' or work done," he found "*no* significant correlation between the profits and the output," which were "*practically independent* in their fluctuations." The correlation coefficient between the percentage fluctuations of profits and output (so defined) about their computed ordinates of linear secular trend was $+ 0 \cdot 29 \pm 0 \cdot 10$ for the period 1880–1912, or $+ 0 \cdot 12 \pm 0 \cdot 11$ for the period 1889–1912. In short, here is a definite denial that, *in practice*, the generalisation of Messrs. Sherrington and Wood works out for the period 1889–1912. It is to be noted, however, that the period under review was different, and that Sir Josiah Stamp treated the problem inductively, seeking what actually did happen under normal trade conditions. His results, nevertheless, were seriously affected by the mathematics of his statistical methods.

We have, then, two diametrically opposed statements, either one of which may influence the policy of public utility control. The curious mind seeks to rationalise the position and discover the truth. This is the *raison d'être* for the present essay. The importance of the subject is clear. Apart from the work of Sir Josiah Stamp, which has limitations, nothing has yet been done to cast light on it from a statistical point of view. Even in the United States, economists, equipped with much more information and a highly developed technique, have not concerned themselves so much with profit as with traffic fluctuations.[1] Some analysis is needed if only to produce rough approximations.

My method of approaching the problem is to pass judgment on the facts historically between 1878 and 1930,[2] a matter of over half a century, discovering, for the railways as a whole, how far and to what extent trade booms and depressions have affected profitability. In this, changes in statistical compilation and the exceptional

. [1] Vide, for example, the series of articles by Professor H. B. Vanderblue in the *Railway Age*, 1924, pp. 783, 885, and 987.

[2] Useful statistical material only became available after the Regulation of Railways Act, 1871. Vide A. E. Kirkus: *Railway Statistics*, 1927.

nature of the post-war depression render necessary the splitting of the period into two parts, 1878–1912 and 1913–1930, but do not make it impossible to secure valid generalisations once the reason for the split is known. Chapters II and III, therefore, deal with the general reaction over these two periods.

But, whilst the relationship between trade conditions and railway profits as a whole is interesting, further study of the individual reactions of the "Big Four" reveals evidence of even more intriguing problems, and Chapter IV is concerned with the facts, between 1884 and 1930, on each of the main systems constituted by the Railways Act, 1921.

Chapter V is concerned with the consumer. The consumer is interested chiefly in rates and fares, quality of service and safety of movement, and, of these, the first is discussed, not from the point of view of what actually has happened, but from the point of view of certain implications which seem to follow from the attempt of the State to control the general rate and fare level through the Railways Act.

The argument is almost entirely statistical and not literary. This in itself is scarcely conducive to smoothness and ease of style, but I have thought it better to be brief and utilitarian in purpose in order to produce the results in a purely analytical form. For the most part the value of the work lies more in the tables than in the matter describing them.

The chief problem which faced the investigation was that of the statistical methods to be employed. In most early studies data were commonly left in their crude form, and no attempt was made to present them in any other. With the development of statistical technique, however, more refined treatment became the rule. A separation was made between seasonal, cyclical, and secular (not to mention "random") movements, and attempts were made to isolate them for individual treatment. In the present case no need was felt for anything other than annual data for several reasons. Not least among these

was the fact that profits are usually determined on an annual basis, and that more intricate details have not yet been compiled over long periods of time. Moreover, where the seasonal content is very much greater than the cyclical, and slightly irregular, its elimination by fixed ratios, such as the link-relative, applicable to every year in a series, occasionally yields unhappy results. Finally, the Railways Act, 1921, which is the chief concern, provides for *annual* revisions of rates and fares on the basis of past *yearly* profits, so that there is all the less need for further dissection. The problem thus narrowed itself down to a choice of methods for the elimination of secular trend, in order, as far as possible, to leave cycles for investigation.

For some purposes it is possible to simplify the statistical manipulation by approaching the problem of the trade cycle "directly," either by means of "first differences" or the "Brumbaugh method,"[1] and I have, on occasion, used the former in a broad treatment of the extremely regular pre-war British cycles with fair results.[2] The difficulty lay in the irregularity of the fluctuations, which had to be smoothed with three-year moving averages. When the problem of time-incidence had to be faced, the method lacked accuracy, though the generalised form of the conclusions was still useful. The Brumbaugh method itself is not fitted for present purposes, because it deals with relatives, and gives no idea of the absolute amount of fluctuation. There remained, therefore, the methods of moving-averages and curve-fitting to be considered. The merits and de-merits of these are common knowledge.[3] Though the latter involves considerably more labour, and in some cases does not yield very successful fits, it has been used because it is more appropriate in view of the varying length of the cycles to be

[1] M. A. Brumbaugh: *Direct Method of Determining Cyclical Fluctuations of Economic Data.*

[2] *Cyclical Fluctuations in the Railway Industry*, Manchester Statistical Society, November 13, 1929.

[3] W. C. Mitchell: *The Business Cycle*, "The Problem and its Setting," Chap. III.

examined, the lack of sufficient "slack" at the end of each of the periods under review to enable a long enough average to be selected, and the general acceptance of the method in present-day statistical technique.

Nevertheless, even curve-fitting has its faults. In the first place, there is no adequate test for "goodness of fit" as between curves with different numbers of constants. This difficulty has been treated in cavalier fashion by mere inspection, and the selection of that formula which appeared best when charted. In some cases period-splitting has been resorted to, but, for the most part, where a single curve could be made to cut through all the apparent cycles, even though roughly, it has been retained in preference to splitting.[1] The effects which follow from the exercise of personal judgment in the selection of the appropriate curve, however, are important, since time-incidence and amplitude are both likely to vary according to the formula chosen. Indeed, this will probably explain the slight difference in the results obtained by Sir Josiah Stamp compared with those obtained in the following pages for the years 1878–1912. The present analysis makes use of third-degree parabolas over a period to which Sir Josiah Stamp less successfully fitted straight lines.

In order to state the facts as clearly as possible, it is necessary to have some way of testing amplitude of fluctuation, so as to measure the amount of "swing" between boom maxima and depression minima. One wants to be able to say, for example, that "gross revenue reached a cyclical minimum in the year x, increased to a maximum in the year y, and recoiled to an equal minimum in the year z, covering, as between maximum and minima, a spread of £ a M"; that "gross expenditure fluctuated over exactly the same years with a corresponding spread of, say, only £ $(a-b)$ M"; and that, "as a result, the fluctuation of net revenue was exactly £ b M."

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[1] This has been done only after consultation with several statisticians, who have assured me that nothing is lost thereby. My special thanks are due to Mr. D. B. Leavens, of the Harvard Business School, in this connection.

If the trend eliminating curves are inappropriate, this becomes virtually impossible, and gross expenditure cycles might be shown as fluctuating more than gross revenue cycles. Given the appropriateness of the trend curves, however, there are two commonly accepted ways in which amplitude may be measured. The more orthodox is that of computing the standard deviation of the variations of the crude data about the ordinates of secular trend. The difficulty in this case is that a rough general figure is obtained, which does not make allowance for special variations in individual cycles. It is quite possible for the absolute amount of fluctuation of gross expenditure to exceed that of gross revenue in two out of four cycles, thus producing negatively related net revenue cycles in two instances; but the standard deviation of the gross expenditure fluctuations over the whole period may be less than that of gross revenue, and thus seemingly indicate a general positive relationship between gross and net revenue. Standard deviations also do not bring out the significance of differences of time-incidence as between different curves, which is essential to a study of interrelationships. The simpler, though in many ways the rougher, method is by computing the difference between the maximum and minimum points of cycles about their trend. The average of the maxima is compared with the average of the minima. Of course, the trend eliminating curve affects this type of measurement also, but, because of its simplicity, its adaptation to single cycles and its comparative ease of compilation, it has been retained as the measure in most of the present calculations.

There are also several other questions of technique which require justification. These, however, are explained for the most part just as they occur, in order to relate them more nearly to the particular circumstances which give rise to them. It is more convenient, once having outlined the general approach, to proceed immediately with the analysis.

THE TRADE CYCLE, 1878–1912

(1)

The most convenient way of approaching a statistical analysis of pre-war cycles is to examine the two blades of Marshall's scissors separately, and with this in mind we may turn first to the demand side of the facts. But whilst, in a broad way, there may be said to be a general condition known as the "demand for transport," in practice it is divisible into two main categories of "passenger" and "goods" movement, and even these can be sub-analysed, of course, into further classes. Nevertheless, having regard to the paucity of information on a comparable basis in the pre-war period as well as to the relative unimportance of some divisions, only the chief need be examined. It is proposed, then, to examine goods traffic figures, breaking in at the bottom of a cycle.

An increase in demand will mean that, at given rates and fares, more goods will be offered for transport. The immediate effect in any ordinary industry is an increase in the price, owing to competition for the commodity in demand, as the quantity of output cannot be immediately increased and producers defend themselves by raising prices. This causes high profits, because costs do not rise so rapidly, largely on account of customary and contract agreements. Automatically, production is stimulated in order that entrepreneurs may reap the harvest of high profits, but this brings about its own demise in a fall of price, whilst, at the same time, the lag of costs tends to reduce profit margins. Equilibrium will be found at a lower price, until the next cycle begins its upward swing. The railway industry, before the war, however, was peculiar in that rates and fares remained steady, so far as we know, in face of increases in demand.[1] It

[1] It is impossible, except at prohibitive cost, to go back over past records in order to construct an index of rates and fares, and it is doubtful if it would be of

therefore follows that increases of demand would tend to show themselves in the quantity of goods requiring transport for given distances rather than in price changes.

Before the war, the only figures for the generality of railways[1] were those of the tonnage of goods conveyed, the chief weaknesses of which are overcounting, omission of distance, and inaccuracy of compilation; but, casting aside for the moment all knowledge of these limitations, a degree of comparability sufficiently accurate to yield useful results may be assumed at least for cyclical purposes.

. In order to secure a convenient index of the state of trade with which to correlate effects in the railway industry, we require something which reflects changes in the physical volume of production. In default of an index of this type going back sufficiently far and constructed with weights appropriate to the railway industry, there seems no better method than to take the percentage of people engaged in production, generally shown as the inverted unemployment percentage.

The unemployment percentage can hardly be said to have a secular trend of any magnitude before the war,

practical use when found. We must rely on the authority of those who have written on the subject in the period. Most valuable of all is the word of Sir Josiah Stamp, in his paper on "The Effect of Trade Fluctuations on Profits" (*Jnl. Rl. Stat. Soc.*, July 1918, p. 581). He there states in relation to railways that "strictly speaking there are no variations in 'price,' save for periodical revisions of rates, and the gross receipts . . . correspond to what we should call in other industries the 'output' or 'work done.'" Moreover, we know that the legislation embodied in the Railway and Canal Traffic Act, 1894, brought about rigidity of rates by putting the onus of justifying increases on to the railway companies. This is brought out by A. W. Kirkaldy and A. D. Evans (*History and Economics of Transport*, p. 124), who state that "in future, increased profit balances could only come from greater economy of working rather than increased charges." See also D. Knoop (*Outlines of Railway Economics*, p. 244), who says that "the Act has tended to prohibit rates from being easily adjusted to meet new conditions." Even apart from these quotations, in default of further information, the assumption will be made that, though secular and seasonal fluctuations took place, there were no cyclical changes of price.

[1] The only exception of importance was the old North-Eastern Railway, which used and made public the ton-mile (Acworth: *Jnl. Rl. Stat. Soc.*, Vol. LXV, Part IV, 1903). The ton-mile was abandoned in the early 1850s after being used by Dr. Lardner in his early studies, and economic history is all the poorer for the change.

but, in order to be consistent with all the other calculations, such trend as did exist between 1878 and 1912 has been eliminated from the statistics of Table 1 by fitting a straight line, centred at 1895,[1] by the method of least squares, with the formula:—

$$y = 5 \cdot 06 - 0 \cdot 068x$$

Cyclical residuals are charted in Curve 1.

The railway goods figures, collected in the same table, prove to be very intractable for the purpose of trend elimination, but successful results can be secured by splitting the period and fitting separate curves as follows:—

1878–1890
$$y = 2535 + 68 \cdot 25x \text{ (00000 tons*)}$$
1890–1912
$$y = 4158 + 138 \cdot 44x - 1 \cdot 015x^2 - 0 \cdot 318x^3 \text{ (00000 tons)}$$

* The figures in brackets refer throughout to the basis on which the formula in question is constructed.

The fluctuations of the crude data about the computed ordinates of secular trend are expressed as percentages and charted in Curve 2.

The conclusions may be stated quite briefly. First of all, on a broad view, it can safely be said that traffic fluctuated cyclically more or less in harmony with employment. Over the period 1878–1912 there were four complete cycles of employment, with minima in 1879, 1886, 1893, 1904, and 1908–09, and maxima in 1882, 1889, 1899, and 1906 respectively. Corresponding to the employment curve there were also four cycles of railway goods traffic, the minima of which occur in 1879, 1886, 1893, 1905, and 1908, and the maxima in 1883, 1891, 1899, and 1907. Slight divergences of the turning-points, of course, are inevitable, but, on the whole, the natural interdependence of events needs little stronger proof than is offered by these figures. Before accepting the sight correlation without further criticism,

[1] All curves in this study are centred in the middle of the periods taken.

TABLE 1

Great Britain: Residual Cycles of Data Relative to the Demand for Railway Transport, 1878–1912

Year	1	2	3	4	5	6
1878	− 0·6	− 4·42	− 152	+ 0·18	− 21	− 21
1879	− 5·3	− 4·92	− 158	− 3·36	− 113	− 30
1880	+ 0·6	+ 2·43	+ 54	+ 0·52	− 9	+ 4
1881	+ 2·5	+ 3·60	+ 102	+ 0·17	− 8	+ 15
1882	+ 3·6	+ 5·21	+ 187	+ 2·09	+ 83	+ 29
1883	+ 3·3	+ 6·36	+ 242	+ 3·43	+ 107	+ 37
1884	− 2·3	+ 0·79	+ 95	+ 2·26	+ 108	+ 22
1885	− 3·6	− 2·57	− 39	− 0·73	+ 21	− 1
1886	− 4·5	− 6·06	− 152	+ 0·43	+ 3	− 14
1887	− 2·0	− 3·21	− 123	− 1·52	− 40	− 16
1888	+ 0·6	− 1·00	− 58	− 3·21	− 81	− 14
1889	+ 3·4	+ 1·98	+ 89	− 1·82	− 8	+ 8
1890	+ 3·3	+ 1·67	+ 113	+ 0·89	+ 68	+ 17
1891	+ 1·8	+ 2·21	+ 124	+ 1·35	+ 50	+ 16
1892	− 1·0	− 0·29	—	+ 0·96	+ 4	− 3
1893	− 2·3	− 8·48	− 288	− 0·93	− 79	− 40
1894	− 1·8	− 1·54	− 158	− 1·00	− 120	− 27
1895	− 0·7	− 1·91	− 194	− 3·21	− 145	− 35
1896	+ 1·7	− 1·06	− 83	− 1·64	− 77	− 16
1897	+ 1·6	+ 2·36	− 26	− 0·10	− 42	− 4
1898	+ 2·1	− 0·24	+ 2	+ 0·10	− 19	− 3
1899	+ 2·6	+ 5·26	+ 179	+ 1·31	+ 58	+ 25
1900	+ 2·2	+ 4·45	+ 203	+ 2·00	+ 111	+ 31
1901	+ 1·3	− 1·20	+ 44	+ 2·41	+ 136	+ 15
1902	+ 0·6	+ 0·42	+ 97	+ 1·49	+ 102	+ 18
1903	− 0·2	− 1·06	+ 28	+ 0·17	+ 61	+ 9
1904	− 1·6	− 2·48	− 51	− 1·27	+ 7	− 5
1905	− 0·6	− 2·61	− 53	− 2·74	− 49	− 10
1906	+ 0·7	+ 0·92	+ 38	− 0·66	− 22	+ 3
1907	+ 0·5	+ 4·40	+ 212	− 0·16	+ 1	+ 25
1908	− 3·6	− 2·25	− 118	+ 0·24	+ 3	− 11
1909	− 3·6	− 2·00	− 159	− 1·67	− 114	− 28
1910	− 0·7	− 0·21	− 56	+ 0·95	− 27	− 9
1911	+ 1·0	+ 0·92	+ 37	+ 1·97	+ 39	+ 7
1912	+ 0·7	+ 0·02	+ 26	− 0·78	+ 24	+ 4

Col. 1 = Employment, per cent.
Col. 2 = Railway Goods Tonnage, per cent.
Col. 3 = Railway Goods Revenue, £0000.

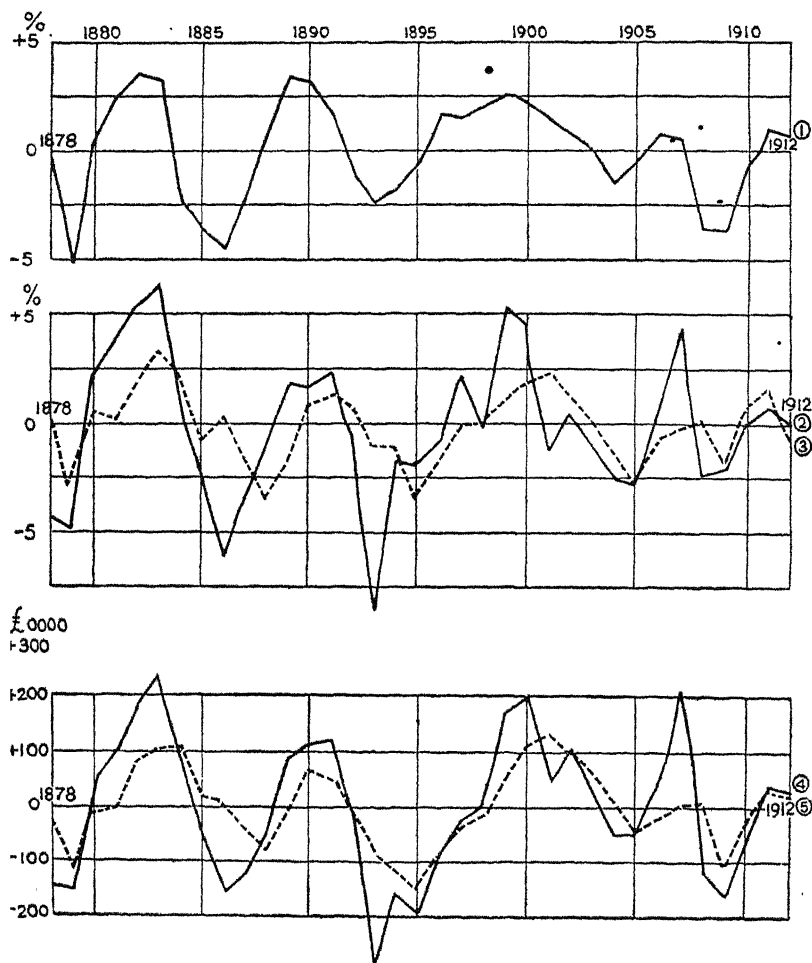Col. 4 = Railway Passenger Journeys, per cent.
Col. 5 = Railway Passenger Revenue, £0000.
Col. 6 = Railway Total Gross Revenue, £00000.

Sources: Col. 1, Abstract of Labour Statistics.
Other Cols., Annual Railway Returns.

CHART I

RESIDUAL CYCLES

Curve 1 = Employment, Per Cent.
2 = Goods Tonnage Conveyed, Per Cent.
3 = Passengers Conveyed, Per Cent.
4 = Gross Goods Revenue, £0000.
5 = Gross Passenger Revenue, £0000.

nevertheless, a further check can be made later through the freight revenue statistics.

The second conclusion is that the degree of traffic. fluctuation was really quite small. Regarding the computed figure of secular trend as "normal," we may say that the minima were 4·92, 6·06, 8·48, 2·61, and 2·25 per cent. respectively below normal, and that the maxima were .6·36, 2·21, 5·26, and 4·40 per cent. above. The average of the minima was thus 9·42 per cent. of trend below the average of the maxima.

Having assumed that rates remained steady within the cycle, it follows almost axiomatically that the total gross money revenue from goods traffic must have tended to vary in very much the same way as the physical volume of traffic. Indeed, this is the key to the stability of gross revenue in the railway as compared with most other industries, because fluctuations in the gross receipts of the latter are usually the result of a two-fold effect, i.e. variations in the volume of production and prices, which reinforce each other, and hence exaggerate fluctuations in the gross final figures.[1] In order to show the course of goods revenue, the statistics, after manipulation, have been collected in Table 1. Secular trend has been eliminated by means of a third degree parabola of the form:—

$$y = 4441 + 102 \cdot 7x + 1 \cdot 146x^2 - 0 \cdot 0717x^3 \ (\pounds 0000)$$

The divergences of the crude data from the computed ordinates of secular trend have been expressed as absolute amounts, and are charted in Curve 4.

Broadly speaking, the conclusions are similar to those obtained from the study of goods traffic, with, however, certain differences which must largely be ascribed to imperfection of the basic data and the mathematics of curve-fitting. In the first place, the maxima and minima in the cycles correspond in essential except for the years 1899–1900. The former was the peak for tonnage, the latter for revenue. This small divergence cannot be really significant because the difference in the cyclical

[1] Stamp, op. cit.

content of the two years is very small in each case. The mere accident of the type of curve used has something to contribute to the probable explanation, though the general direction seems the same in both.

The second difficulty is that the goods revenue curve shows a decline in 1895, which is quite invisible·in the goods tonnage curve, whilst the latter's random decline of 1898 is smoothed out in the former. Owing to the fact that the general level of rates is different for different commodities, these contrary movements, as well as the divergency of maximum in 1899–1900, can only be expected. A large decrease in the tonnage of a low-rated commodity like coal, together with a relatively small increase in the tonnage of a high-rated commodity, can easily bring about a decline in total tonnage and, at the same time, an increase in receipts. For this reason, among all the others already advanced, the cautious investigator fears to commit himself to any definite explanation of phenomena which may have causes in the nature of the basic data used. Inconsistencies can be quite consistent when the crude data are known to be subject to different influences.

The third slight difference between the cyclical fluctuations of goods traffic volume and revenue lies in the degree of movement. The years of minima were 4·66, 4·15, 6·79, 0·98, and 2·69 per cent. respectively below normal, whilst the maxima were 6·92, 3·06, 4·08, and 3·71 per cent. above, thus yielding an average 8·29 per cent. of trend above the average of the minima. These, it will be observed, are figures quite different from those for tonnage, largely because the weights in traffic revenue vary owing to the different levels of rates for different commodities. From this discussion, nevertheless, the general conclusion emerges, minor differences apart, that goods traffic volume and goods traffic revenue were closely related to the physical volume of production, being small in the degree of their fluctuation.

Turning next to passenger traffic, results similar to those obtained for goods might be expected to appear.

Limitations are imposed, however, in greater degree upon the assumptions previously made, because fares have been more flexible than rates. This at least is true of seasonal changes, as the companies have long given special and variable concessions for holiday travel. Notwithstanding this fact, however, the general level of charges certainly cannot be measured, and again the assumption must be made that, though seasonal and secular variations may have taken place, cyclical movement has not existed.

Variations of prosperity will therefore· tend to have much the same effect as on goods traffic, i.e. they will cause variations in the number of passengers transported. It is impossible to deal with all the classes of passengers, but the best general figure is that of the total number of passengers conveyed in first-, second-, and third-class compartments, exclusive of season-ticket holders. The latter are omitted primarily because there is no satisfactory method of equating them to a "conveyed" basis, but also because there are no comparable statistics over the whole period under review. In the early years up to 1902 the total number of season tickets issued, regardless of their tenure, was given, but after (and including) 1902 they were brought to the equivalent of annual tickets. It will be as well to recall that there is over-counting in the total, owing to the fact that a single journey is counted as many times as the number of separately owned lines over which it is taken, and hence that amalgamations inevitably reflect themselves in artificial reductions in the number of passengers conveyed. Further, there is no element of distance in the crude figures, and, of course, there have been inaccuracies of compilation. Assuming comparability for cyclical purposes, by virtue of the rule that complicating factors tend to average themselves out, conclusions may be drawn from the figures given in Table 1. Secular trend has been eliminated over two separate periods, as follows:—

$$1878–1894 \quad y = 704 + 20 \cdot 84x + 0 \cdot 147x^2 \quad \text{(000000)}$$
$$1892–1912 \quad y = 1143 + 23x - 0 \cdot 98x^2 \quad \text{(000000)}$$

The divergences of the crude data from the computed ordinates of secular trend have been expressed as percentages and charted in Curve 3.

The general conclusion, of course, confirms the anticipation that trade conditions should reflect themselves in variations of passenger travel. There were clearly four complete cycles over the whole period, with minima in 1879, 1888, 1895, 1905, and 1909,. and maxima in 1883, 1891, 1901, and 1908. The striking phenomenon, however, is that these turning-points, except in one or two instances, do not correspond with those of either employment or freight traffic volume, and manifest, indeed, a marked tendency to lag. The danger of over-confidence in regard to time-incidence is realised, especially in view of the implications of the curve-fitting method, but the regularity of this phenomenon may have a real explanation, because, in a general way, it is confirmed by passenger revenue statistics. It is, for example, natural to suppose that with unemployment will come a decrease in purchasing power, and that this will be reflected in a decline of the demand for passenger journeys. But people travel for two reasons, pleasure and business. The majority of the workers who come under the latter heading are season and workmen's ticket-holders, and are not included in the figures given for ordinary passenger journeys in the sample. Pleasure travel, and travel by the better-paid business-man would constitute the major part of ordinary traffic. If there is any validity in the statistical results, it is possible that the purchasing power for these classes only corresponded with a lag; that the middle-class rentiers, benefiting by price declines, were able to maintain the traffic for a year or two before the declines became big enough to obliterate their influence; that travel was such a conventional necessity for the class of people covered by the sample, that they maintained their expenditure as long as possible. In brief, a number of conceivable explanations can be given, but there can, as yet, be no proof. We may only note the fact and pass on.

The second conclusion is that the degree of fluctuation was much less than for employment, goods tonnage, or goods revenue. The five years of minimum were 3.36,. 3.21, 3.21, 2.74, and, 1.67 per cent. below the selected line of secular trend, whilst the maxima were 3.43, 1.35, 2.41, and 0.24 per cent. above. This represents an average swing of 4.70 points. Apparently, therefore, the demand for passenger travel was more stable than that for goods transport as between good and bad times.

Just as in goods transport we discovered similarity of movement between the physical volume of business and gross revenue, subject to the existence of random fluctuations and a difference in magnitude of swing, so in passenger transport the same close connection can be revealed. The statistics of passenger revenue are also collected in Table 1, secular trend having been eliminated by a third degree parabola of the form:—

$$y = 3697 + 104 \cdot 8x + 0 \cdot 59x^2 - 0 \cdot 097x^3 \quad (\text{£0000})$$

As in the case of freight revenue, the residuals have been retained in their absolute form, in order to compare the relative influence of freight and passenger revenue in causing fluctuations of total gross revenue. The figures are charted in Curve 5.

Relative to the passenger journey curve, the turning-points are identical in all instances except one, thus confirming the existence of the lag manifested by the former compared with employment.

The magnitude of the fluctuations, like that of passenger journeys, was quite small, minima being 4.40, 2.68, 3.92, 1.04, and 2.27 per cent. below trend, and maxima 3.97, 2.12, 3.14, and 0.06 per cent. above. As between boom and depression the average difference was one of 5.18 points.

Finally, of course, whether absolute or percentage divergences from trend are taken, the fluctuations of passenger traffic revenue proved to be less in extent than those of goods traffic revenue. As regards the former, the average swing over the period 1878–1912 was

£3·57 M for goods and £1·79 M for passengers; as regards the latter, the corresponding figures were 8·29 and 5·18 per cent. respectively. The significance of this lies in the fact that companies dependent to a large extent on goods traffic must have been more affected by variations in the volume of their business than those enjoying a relatively large passenger business. It will be shown later that the profits of the goods. lines have not necessarily varied very much more than those of passenger lines, but this does not affect the validity of the generalisation concerning their traffic. A highly fluctuating traffic can go with a stable net income, and a stable traffic with a fluctuating net income.

Exactly why passenger transport should have been more stable than goods transport it is difficult to say on account of the masks which the very breadth of the terms "passengers" and "goods" throw over the details comprised within them. The regularity of the phenomenon, however, seems to indicate the operation of some fundamental law or laws, the inspection of which would in itself be labour enough for separate study. We know, of course, that the heavy constructional trades were more violent in their fluctuations than others, and good reasons have been put forward to explain this.[1] That the basic industries, by the very fact of using heavy materials, count for a good deal in railway tonnage figures is clear,[2] and that they will influence total gross revenue in proportion to the level of rates which they are charged is a natural corollary, but this explains only one side. It is conceivable, in addition, that the passenger journeys taken by the people who were subject to wide fluctuations of employment (because they were engaged in constructional trades) were so few that they had little weight in causing large absolute fluctuations in total passenger traffic, and that the majority of the travelling public were drawn from those with relatively stable employment and high incomes. In addition, of course, a number of other

[1] Pigou: *Industrial Fluctuations*, pp. 107–9.
[2] See Table 7 for an analysis of post-war traffic tonnages.

factors may enter into the explanation, such as the greater regularity of consumption compared with production and the conventional nature of travelling, etc. It would be rash, however, to offer any complete solution without more exhaustive analyses, for to judge from statistics of a general nature is a little imprudent.

It is clearly impossible to construct a statistical unit representative of the total physical demand for railway transport in all its spheres, but, if to complete the general description of the demand side of the analysis, we total the revenue obtained from goods, passengers, and ancillary undertakings, a good composite picture may be obtained. An important difficulty lies in the fact that a change was made in the compilation of the statistics from hotels, etc., in 1901. Previously, only the *net* expenditure on these was given, but in that year *gross revenue* and *expenditure* were inserted in such a way as to vitiate comparison with the earlier years in the minute details of cyclical fluctuations. The increase in expenditure on hotels in 1901, compared with 1900, was just over a million pounds sterling, and a similar increase showed in receipts. One cannot say what proportion of this item was caused by the change in accounting and what proportion represented a real increase, but the arbitrary sum of £1 M has been deducted from all the years 1901 to 1912 in order to secure comparability with the early years. Even this is unfortunate, because the deductions begin just at a year of turning-point in the cycle, which is thus badly obscured. The statistics for 1901–1912, then, are in the nature of an index, and must not be taken for wrong calculations. Only great familiarity with the material enables one to detect a small change like this, which has deceived others who have approached the figures at their face value.[1]

The statistics of gross revenue, as thus modified, have been treated for trend elimination by means of a third degree parabola, constructed to the formula:—

$$y = 859 + 23 \cdot 2x + 0 \cdot 224x^2 - 0 \cdot 019x^3 \quad (£00000)$$

[1] E.g. Aftalion, in his *Crises Périodiques de Surproduction.*

Cyclical residuals, charted in Curve 12, have been retained as absolutes in Table 1, though the interested ·reader, as in all calculations, can work back from the formula to the crude figures and percentages. The absolute divergences are necessary for comparison with gross expenditure. It is quite conceivable that gross revenue may fluctuate less than gross expenditure as a percentage, without net revenue fluctuating negatively thereto, simply because it is the absolute amount of deviation which matters.

The chief conclusions are quite clear and simple. The first confirms what is bound to follow from the characteristics of the total's constituents, i.e. that there were regular cyclical fluctuations, though there was, to some extent, an averaging of time-incidence through the combination of goods and passenger revenue. Owing, however, to the fact that the curve of the former is smoother, with less pronounced maxima and minima, than the curve of the latter, and also owing to the fact that other sources of revenue were very small compared with the total, gross revenue turning-points were more or less controlled by the movements of goods revenue, though we find certain divergences from this result. In short, the effect of passenger revenue was felt as a stabilising influence on gross revenue. The more dependent a company was on goods, the more it might expect fluctuations of gross revenue.

The second conclusion is that the degree of the fluctuation, though covering sums of some absolute magnitude, was relatively small. The years of minimum were, respectively, £3·00 M, £1·60 M, £4·00 M, £1·00 M, and £2·80 M below normal, and the years of maximum £3·70 M, £1·70 M, £3·10 M, and £2·50 M above. As between boom and depression the average movement thus worked out at approximately £5·20 M in terms of absolutes, or 6·40 per cent. in terms of percentages. It is clear that this percentage strikes an average between those already given for goods and passenger revenue.

The fact that railway gross revenues have responded

closely to trade movements has long been known, and considerable reliance has been placed on them as an index of trade conditions, especially in America. The. only contribution which the present section makes is to collect and synthesise annual data in a more detailed manner than previously, to put the statistics into their proper perspective, and to offer tentative explanations for certain of the phenomena often accepted as a mere matter of course.

(2)

With the existence of cyclical fluctuations in the amount of goods and passengers conveyed there will naturally follow similar fluctuations in the physical effort put forward to convey them, and hence the supply side of the picture is important. Nobody has yet constructed a unit of physical performance which is so representative of the efforts made to move traffic that it cannot be criticised, and, even if it were available, we have no figures to investigate its significance. All that we have for the years 1878–1912 are figures of train-miles, analysed between goods, passenger, and mixed trains. That the train-mile gives no idea of the weight hauled, the length of the train, the power used by the engine, and the work done in warehouses, stations, yards, offices, etc., is obvious, but it is valuable, if not essential, to review the movements of the only series we have. For, if it can be shown that physical effort increased in booms and decreased in depressions to a less extent than the traffic which it was designed to move, then, according to static economics (as manifested in the law of decreasing costs), there is good reason for anticipating a tendency for high boom and low depression profits.

.Statistics of goods train-miles are collected in Table 2. Trend, in this case, takes a marked change in direction following the year 1900, and, unlike that of goods traffic to which it ministers, becomes negative after a time, thus indicating that a given number of train-miles were producing a much greater number of transportation

TABLE 2

Great Britain: Residual Cycles of Data Relative to the Supply of Railway Transport, 1878–1912

Year	1	2	3	4	5	6	7
1878	− 3·02	− 0·83	− 10	—	—	—	—
1879	− 3·78	− 2·77	− 19	—	—	—	—
1880	+ 0·90	− 0·17	− 2	—	—	·	—
1881	+ 2·02	− 0·83	+ 11	—	—	—	—
1882	+ 3·01	+ 0·48	+ 19	—	—	—	—
1883	+ 4·89	+ 1·87	+ 27	—	—	—	—
1884	+ 1·49	+ 2·34	+ 18	—	—	—	—
1885	− 1·21	+ 1·32	+ 6	—	—	—	—
1886	− 3·41	—	− 5	—	—	—	—
1887	− 3·19	− 0·76	− 12	—	—	—	—
1888	− 1·68	− 1·21	− 17	—	—	—	—
1889	+ 0·97	− 0·26	− 9	—	—	—	—
1890	+ 2·42	+ 0·65	+ 7	—	—	—	—
1891	+ 3·97	+ 1·12	+ 12	—	—	—	—
1892	+ 2·06	+ 1·64	—	+ 79	+ 67	—	+ 4·29
1893	− 4·78	− 0·41	− 17	+ 36	− 1	—	− 0·86
1894	− 2·30	− 1·67	− 20	− 10	− 13	—	− 1·36
1895	− 3·83	− 2·07	− 32	− 54	− 50	—	− 3·77
1896	− 0·91	− 0·16	− 27	− 94	− 45	− 1·37	− 3·15
1897	+ 1·28	+ 1·16	− 19	− 99	− 34	− 0·04	− 1·32
1898	+ 3·59	+ 1·43	− 9	− 73	− 18	+ 0·48	− 0·03
1899	+ 7·62	+ 1·98	+ 12	− 9	+ 18	+ 2·71	+ 2·42
1900	+ 8·03	+ 0·48	+ 38	+ 165	+ 54	+ 1·27	+ 3·40
1901	+ 3·45	− 0·61	+ 36	+ 143	+ 40	+ 0·55	+ 2·32
1902	+ 1·29	− 1·45	+ 21	+ 13	+ 35	− 0·31	+ 2·06
1903	− 4·20	− 2·21	+ 10	− 15	− 9	− 1·01	+ 0·84
1904	− 7·41	− 1·29	− 3	− 42	− 29	− 0·66	− 0·85
1905	− 6·67	− 1·60	− 11	− 66	− 39	− 0·15	− 1·94
1906	− 3·27	+ 0·12	− 2	− 53	− 4	− 0·19	− 3·43
1907	+ 1·47	+ 1·83	+ 23	+ 64	+ 56	+ 0·99	+ 1·02
1908	− 1·56	+ 1·12	+ 6	+ 93	+ 22	− 2·66	− 1·18
1909	− 2·30	− 0·36	− 21	− 30	− 22	− 1·97	− 2·45
1910	+ 0·36	− 0·08	− 19	− 32	− 23	− 4·60	− 1·98
1911	+ 4·13	+ 0·70	− 9	− 34	− 2	+ 2·66	+ 0·43
1912	+ 3·90	− 0·16	+ 7	+ 20	+ 3	+ 4·59	+ 3·05

Col. 1 = Goods Train Mileage, per cent.

Col. 2 = Passenger Train Mileage, per cent.

Col. 3 = Total Gross Expenditure, £00000.

Col. 4 = Estimated Cost of Locomotive Coal, £0000.

Col. 5 = Estimated Other Expenditure in Locomotive Department, £0000.

Col. 6 = Average Earnings Railway Labour, per cent.

Col. 7 = Expenditures on Wages in Certain Departments, per cent.

Sources: Col. 6, Board of Trade Abstract of "Changes in Rates of Wages and Hours of Labour in the United Kingdom." Other Cols., Annual Railway Returns.

units throughout the system. Due in part to the increase in more powerful locomotives, some of the change can also be ascribed to the yearly improvement in efficiency. which began at this time. The change in secular trend is so marked that the fitting of the eliminating curve becomes a matter of some speculation, and a practical compromise has been made by splitting the period as follows:—

$$1878-1894 \quad y = 1261 + 25 \cdot 05x \qquad \text{(ooooo)}$$
$$1892-1912 \quad y = 1623 + 0 \cdot 4x - 2 \cdot 17x^2 \quad \text{(ooooo)}$$

The divergences of the crude data from the computed ordinates of secular trend have been expressed as percentages in Table 2, and charted in Curve 6.

Definite cyclical movement appears in the residuals, with minima in 1879, 1886, 1893, 1904, and 1909, and maxima in 1883, 1891, 1900, and 1907. These points, with a minor exception, correspond fairly closely with those obtained for goods tonnage.

Minima were, respectively, $3 \cdot 78$, $3 \cdot 41$, $4 \cdot 78$, $7 \cdot 41$, and $2 \cdot 30$ per cent. below trend, whilst maxima were $4 \cdot 89$, $3 \cdot 97$, $8 \cdot 03$, and $1 \cdot 47$ per cent. above. One of these cycles appears to be more violent than the corresponding cycle of goods traffic, though this may conceivably be due to the awkwardness of trend fit; but, on the whole, the average movement is between $8 \cdot 93$ per cent. of trend, or less than that of goods traffic, over the same period, by $0 \cdot 49$ per cent.

Though this generalisation is valuable in connection with the tendency towards increasing returns in booms, there is need for some caution in its use. In the first place, though the figures may suggest heavier train loading in booms and lighter train loading in depressions, it should be recalled that the goods traffic figures are not ton-miles. Secondly, even if the *average* load did fluctuate cyclically, it may have meant nothing. If the heaviest train loads were usually in traffic, such as iron and coal, which are notoriously subject to fluctuation, then, even without any change in the normal make-up

CHART II
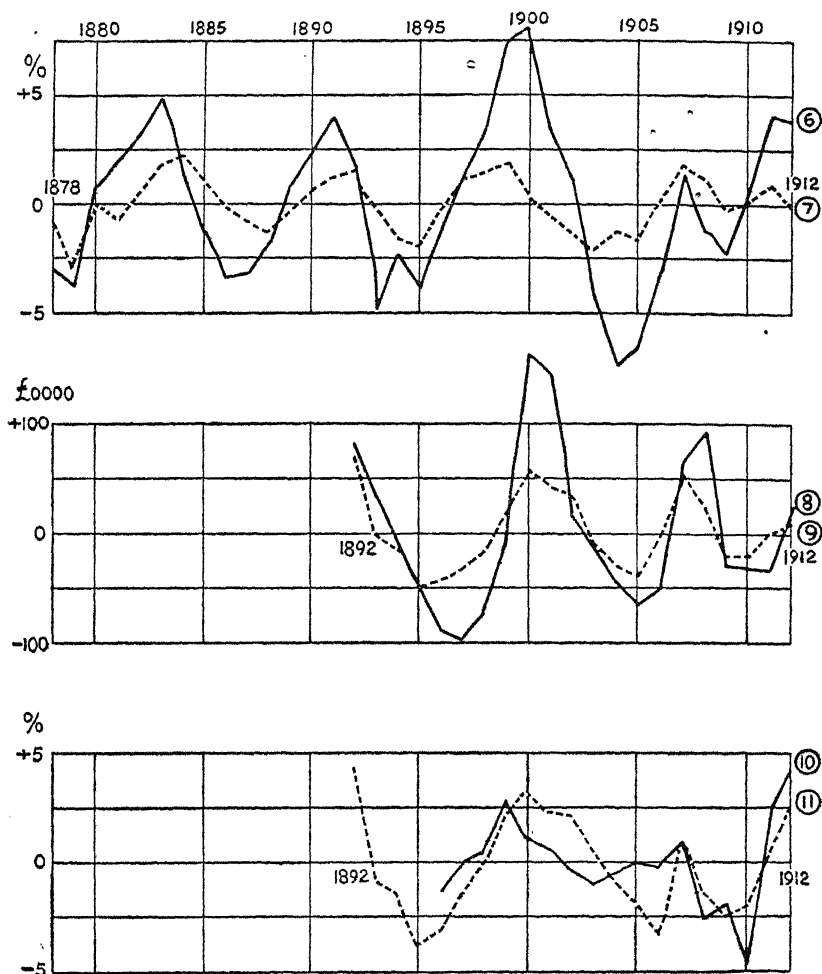
RESIDUAL CYCLES

Curve 6 = Goods Train Miles, Per Cent.
      7 = Passenger Train Miles, Per Cent.
      8 = Estimated Cost of Locomotive Coal, £0000.
      9 = Estimated Residue of Cost in the Locomotive Department, £0000.
   10 = Average Earnings of Railway Labour, Per Cent.
   11 = Estimated Expenditure on Wages, Per Cent.

of trains, the *average* load would tend to rise in booms and fall in depressions. The very fact that goods train-mileage can be more accurately adjusted to traffic require-ments than can passenger train-mileage, through "un-booked" and "optional" runnings, would seem to strengthen this objection. Thirdly, the difference between train-mileage and goods tonnage fluctuation is quite small,. and there are always limits within which the cautious statistician must allow his material to have play before drawing concrete conclusions from it. Neverthe-less, the comparison is suggestive, and certainly does not disprove the *prima facie* argument.

Corresponding to the comparison between volume and physical effort made in producing goods transport, a similar analysis can be made for passengers. The statistics of passenger train-miles (Table 2) have been treated for secular trend, as before, by period-splitting:—

$$1878–1894 \quad y = 1407 + 41 \cdot 26x \qquad \text{(00000)}$$
$$1892–1912 \quad y = 2205 + 58 \cdot 7x - x^2 - 0 \cdot 116x^3 \text{ (00000)}$$

cyclical percentage residual being shown in Curve 7.

Again, the existence of cycle can clearly be marked, the years of minimum being 1879, 1888, 1895, 1903, and 1909, and the years of maximum 1884, 1892, 1899, and 1907. It is clear, on the other hand, from visual comparison, that these points tend to differ somewhat from those of passenger traffic volume, though there is undoubted confirmation, within the limits of the curve-fitting method, of the lag relative to goods traffic. On the whole, however, I am inclined to the view that passenger train-mileage corresponded fairly faithfully with pas-senger traffic volume. It should be recalled that, after all, passenger services are less elastic than goods services, as•trains are run in many cases regardless of the traffic offering, in order to meet public requirements. They may run lightly loaded, or even with less carriages, but, from the point of view of train-miles, the figure remains constant.

As to magnitude of fluctuation, it can be said that the

minima were 2·77, 1·21, 2·07, 2·21, and 0·36 per cent. below trend, and the maxima 2·34, 1·64, 1·98, and 1·83 per cent. above, thus averaging a swing, as between boom and depression, of 3·67 per cent. of trend. Since the sample of passenger traffic fluctuated by 4·70 per cent., assuming that the sample was reasonably representative of actualities, the same general conclusion emerges as in the case of goods traffic. In the static sense, one would expect profits to be higher in booms than in depressions. We turn next to monetary aspects.

Now, whilst *net revenue*, which, for lack of a better term, we shall call *profit*, is the result of the interaction of monetary forces on the supply side as well as the demand side, the former presents rather greater difficulties than the latter. Of these, the most important lies in the impossibility of apportioning railway costs as between different types of traffic (e.g. goods and passengers), or as between different units of a given class of traffic. One cannot tell, except by using assumed bases for apportioning joint expenditure,[1] exactly how much of total expenditure is due to goods or passenger traffic, still less how much is due to new traffic accretions. We are obliged, therefore, to deal only in the gross figures of total costs.

A second difficulty lies in the nature of the railway account system. It is an axiom of good accounting that capital expenditure should be capitalised, and that only revenue expenditure should be debited against current account; but there used to be a tendency for English companies to make capital expenditure out of revenue, and vice versa, according as to whether the policy was conservative or otherwise.[2] Without a proper knowledge of how the figures were obtained, one is bound to be cautious. Down to the year 1913 English statistics cannot be called reliable.

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[1] American attempts to apportion always make use of assumed bases. Cf. W. J. Cunningham: "Separation of Railway Operating Expenses between Freight and Passenger Services," *Qrly. Jnl. Econ.*, Vol. XXII, February 1917.

[2] E. R. McDermott: *Railways*, p. 158 et seq.

Thirdly, maintenance and renewal expenditure can be allowed to vary within very wide limits each year, simply because there is a large margin of safety in the condition of the permanent way. It has been said that certain American railroads might go as long as three years without renewing ties (sleepers) other than on account of definite breakages, and that the condition of the line would still be quite good. The same rule applies to British lines and to different parts of the road bed. That it is possible, in a physical sense, to postpone expenditure was proved during the control of English railways from 1914 to 1920. The main point of principle, however, is that an arbitrary variable is placed in the hands of a railway company, to be used as an offset to natural tendencies in short period profit fluctuations. If times are bad, dividends can be maintained by postponing expenditure. When recovery takes place, provided that it is not delayed too long, the arrears of maintenance can be made up. Every sound system of public utility regulation must require provision of an adequate depreciation or maintenance policy each year if profits are to be controlled, as, otherwise, adjustment of charges to give fixed revenues is affected by the arbitrary provisions made by boards of directors. On account of this variable, any conclusions as to past railway profits are subject to modification. One particular tendency is likely to prevail, however. Maintenance is likely to be curtailed during periods of low profits and increased during periods of high profits. The chief aim of the railway managements will be to prevent dividends falling in bad times and to make up for deficiencies of maintenance during good times. If, despite these normal tendencies, we find that variation in net revenue *does* take place, then we may reasonably assume that there has been some other influence strong enough to counteract them.

Finally, of course, it must be recalled that, though in the early years it was the custom only to insert net figures for hotels, etc., under the heading "Miscellaneous Expenditure," the gross figures were used as from 1901.

This has the effect of causing a sudden artificial increase in the year of change, and it has been allowed for, as in the case of gross revenue, by deducting the arbitrary figure of £1 M from the total expenditure of all years subsequent to and including that of change, in such a way as to maintain comparability with the earlier period. There is thus an artificial element in the figures used, as they do not represent those given in the Annual Railway Returns.

Without labouring further the need for caution in reviewing the statistics, we may next proceed to examine the course of total expenditure over the period 1878–1912. The absolute cycles (Table 2) have been obtained by eliminating trend with the formula:—

$$y = 492 + 18 \cdot 4x + 0 \cdot 19x^2 - 0 \cdot 019x^3 \quad (£00000)$$

and are charted in Curve 13.

The chief conclusion points to the existence of definite cycles, even smoother in their operation than those of gross revenue. Minima occur in 1879, 1888, 1895, 1905, and 1909; maxima in 1883, 1891, 1900, and 1907. In these turning-points are several which differ from those of gross revenue. The third minimum follows the third minimum of gross revenue by two years, though it is true that the minimum of gross expenditure in 1895 does not seem very pronounced, and might, with another trend formula, fitted to another period, etc., have appeared otherwise. The second maximum also differs slightly. As industrial costs normally do tend to lag after receipts, however, these divergences do not seem unduly disturbing.

Concerning the magnitude of the fluctuations, we learn that the years of minimum were 5·85, 4·49, 6·50, 1·63, and 2·86 per cent. below trend, and the maxima 8·16, 2·84, 6·47, and 3·25 per cent. above, thus averaging a movement of 9·45 per cent. Contrasting this with the corresponding figure (6·40 per cent.) obtained for gross revenue, it is clear that, relatively speaking, gross expenditure fluctuated more violently. It has been pointed out, however, that it is not a neces-

sary corollary that, given similarity of time-incidence, together with greater *percentage* fluctuations of gross expenditure, net revenue should fluctuate negatively to both gross revenue and expenditure. If the former is much greater than the latter, it is possible that a smaller percentage increase represents a greater absolute increase, and, since net revenue is the difference, not between percentages but between *absolute* amounts, it may increase with gross revenue. Similar arguments apply to a decrease, of course. The absolute amount of change in gross expenditure is the most important—indeed, the only factor in the problem. Expressed, therefore, as crude amounts, the years of minima were, respectively, £1·9 M, £1·7 M, £3·2 M, £1·1 M, and £2·1 M below; and the years of maximum, respectively, £2·7 M, £1·2 M, £3·8 M, and £2·3 M above trend. The average movement thus covered £4·5 M, or rather less than that (£5·2 M) of gross revenue. It should be remembered, nevertheless, that this average, though indicating a tendency towards high boom and low depression profits, covers some divergence of detail.

We now know that gross revenue and gross expenditure fluctuated in waves, and require to discover whether the two cancelled out to give a net revenue which was stable, or whether they varied in such a way as to cause fluctuations of net revenue which themselves moved in waves.

(3)

It is somewhat natural to argue that an inevitable result of cyclical fluctuations in the volume of railway traffic must be similar fluctuations in net revenues. Modern analysis shows that, in static conditions, between 50 and 60 per cent. of railway expenditure does not vary with the quantity of traffic, being more or less fixed.[1]

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[1] The exact details of the proportion of fixed expenditure are not important. At the time when W. M. Acworth wrote his *Elements of Railway Economics* he estimated that 50 per cent. only fell into this category; but since the war the figures have apparently varied, because Messrs. W. V. Wood and C. E. R. Sherrington, in Memo. No. 11 (*Railway Industry of Great Britain*, 1927),

If, therefore, traffic increases during booms, one would naturally expect a tendency towards greater profits. With fixity of charges, gross revenue would vary with total traffic, but gross costs would vary to a much less extent, and the residue available for profits would increase. Conversely, during trade depressions, gross revenue would decline in proportion to traffic, but not so gross expenditure, which would fall in a less degree, thus causing net revenue to decline. Furthermore, one would also expect net revenue to vary to a relatively greater extent than gross revenue, because the former is only a small proportion of the latter. A given percentage alteration in gross revenue, other things being equal, causes an absolute increase in net revenue which is a greater percentage of the latter than it is of gross revenue. In terms of pure theory, the tendency is usually illustrated as follows, assuming 50 per cent. of costs as fixed:—

Traffic x			Traffic $1 \cdot 5x$		
Gross Revenue ..	...	100	Gross Revenue	...	150
Gross Expenditure	...	80	Gross Expenditure	...	100
Net Revenue ...	...	20	Net Revenue	...	50

Percentage increase of gross revenue = 50
Percentage increase of net revenue = 150

These are the tendencies which follow from a study of static railway economics. The only qualification, which would be admitted, is the fact that expenditure, after a time, increases more than in proportion to traffic, owing to the inevitable saturation of the lines and the necessity for some form of reconstruction, etc., to enable the organisation to deal with it.

Now whilst all this is true, in the conditions assumed, it does not cover the case when prices fluctuate. On consideration it becomes clear that a different result might be expected. It will be remembered that the first

estimated that "probably over 60 per cent. of railway expenditure does not vary with the quantity of traffic" (p. 18).

important assumption stressed in dealing with the
demand for transport was that prices, i.e. rates and fares,
remained cyclically constant on the selling side. To the
extent that this was true, and most critics will accept
it for the period 1878–1912, we are able to fix one of
the variables in the equation determining profits. An
important cause of profit fluctuations in most industries
lies in the fact that the price obtained for their products
changes more rapidly, either upwards or downwards,
than the prices which they pay for the factors consumed
in making their product, so that there is a continued lag
of costs prices behind receipts prices. But by having
prices on the selling side fixed cyclically for railways
during the period 1878–1912, we are able to watch
the operations of the other variables. If prices were the
only remaining variable on the costs side, what might
we expect? The companies were unable to control the
prices of many of the things which they purchased,
i.e. they could not insist that, because their own charges
were rigid, coal-sellers should let them have coal at
fixed rates. They had to buy at current market prices,
and purely market influences therefore operated to some
extent on the supply side, where outside purchases of
materials were made. It is true that they had partial
control of their wage payments, because of the sheltered
nature of the industry, and it is also true that they had
the power of controlling, within wide limits, their
expenditure on maintenance and renewal of permanent
way, etc.; but there was always much expenditure which
was beyond effective control and for which the prices
were determined by market influences. Now we know
that prices move cyclically, rising in booms and falling
in depressions. Given these two conditions, *stability* of
prices on the demand side and *fluctuating* prices for
"compulsory" expenditure on the supply side, the obvious
tendency, other things being equal, would be for profits
to vary inversely with general trade conditions, being
highest during depressions and lowest during booms.

Perhaps this is what Sir Josiah Stamp had at the

back of his mind in 1918, for we find him writing as follows :—

On a comparison of the price of coal each year with railway profits for the same year, or more particularly for the following year, I find the series closely correlated in an opposite direction, i.e. if the price of coal is markedly increased, then the railway profits are clearly less in the following year. The negative correlation is high and significant. . . .

Linear trend. . . . Years 1892–1912, with a lag of one year, $r = -0.65 \pm 0.08$.[1]

It is not clear, however, that he did think along these lines, because he is careful to avoid any statement that the high correlation coefficient meant a high degree of "causal" effect. In other words, he merely wanted an empirical forecasting device, and hit upon one with a reasonable degree of accuracy over the period taken as a whole, though I am inclined to think that the result, even then, was part product of the trend eliminating formula chosen. On the other hand, there is an implication that some form of causal connection did exist.[2]

In the United States, too, there is just a hint that the same idea has occasionally been behind rate-structure theory. The war period was exceptional in many ways, but not least in its effect in causing a phenomenal rise of prices. For a time public utility rates were not raised, and profits fell considerably. Many utility corporations therefore began to use the "coal contract" system,[3] under which the charges levied on the consumers were made to vary on a sliding scale linked to the price of coal. In this there is the assumption that profits depend inversely, other things being equal, on the price of coal. In the long run this would undoubtedly be true, but other things have rarely been equal.

In the static tendency towards greater profits during

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[1] *Jnl. Rl. Stat. Soc.*, loc. cit.

[2] Thus, he uses coal prices to compare with gas profits, knowing well that coal is one of the chief costs in the manufacture of gas, and in this way seemed to imply a similar type of causation.

[3] *Public Utility Reports Annotated*, 1919, A, p. 66, B, p. 34, and D, p. 816.

booms and the actual tendency towards greater profits
during depressions, we have two conflicting movements.
To these we must add a third in the incalculable effect
of human nature.[1] It has already been said that the effect
of low profits would normally be to restrict maintenance
expenditure, and of high profits to make up on deficiencies.
Here is something which, though an effect of, also *affects*
the profit level. One thing is clear, however. If, in face
of the arbitrary effect of this variable to stabilise profits,
we find that they actually do fluctuate, we may say that
the neutralising tendency has been overcome by the
operation of the other two variables which has proved
the more powerful. The first two variables are the most
important, and whichever proved the stronger would
also have to reckon with the third. The third should
normally be the champion of the loser in the fight between
the other two, no matter which might be the loser.

So far the tendencies have been discussed in general
terms without reference to actual results, but this is a
convenient approach to the raw statistics. It enables us
to rationalise the position more rapidly. The only way
of testing the results of a conflict between two unknown
independent quantities, however, is to look at the facts.
Statistics of the absolute net revenue cycles are collected
in Table 3 and charted in Curve 14. It has been assumed
that the secular trend could be eliminated by finding the
difference between the functions used for gross revenue
and expenditure respectively, thus:—

$$y = 367 + 4\cdot8x + 0\cdot03x^2 \quad (\pounds 00000)$$

It is evident, from visual inspection of the cycles, that
there was greater irregularity of movement than in the
case of either gross revenue or expenditure. There were
obvious minima in 1879, 1886, 1893, 1901, and 1908,
but of these the second and last preceded gross revenue
by one year, and the third and fourth by two and four

[1] There might be a fourth in "operating efficiency." This is likely to be
greater in depression than boom, of course, and its operation would therefore
tend to strengthen that of the third variable here described.

Table 3

Great Britain: Residual Cycles of Data Relative to Railway Profits, 1878–1912

Year	1	2	3	4
1878	− 11	− 1·85	—	+ · 0·70
1879	− 13	− 2·79	—	· − 8·01
1880	+ 5	+ 3·04	—	+ 6·79
1881	+ 4	+ 1·40	—	+ 4·72
1882	+ 9	+ 2·59	—	+ ·6·05
1883	+ 10	+ 2·13	—	+ 4·70
1884	+ 3	− 0·24	—	− 2·91
1885	− 7	− 3·35	—	− 8·80
1886	− 9	− 3·37	—	− 10·45
1887	− 4	− 2·42	—	− 6·42
1888	+ 3	—	—	− 2·09
1889	+ 16	+ 4·70	—	+ 9·39
1890	+ 10	+ 2·74	—	+ 7·38
1891	+ 4	+ 1·01	—	+ 2·66
1892	− 3	− 1·53	− 0·48	− 1·97
1893	− 23	− 7·24	− 6·23	− 12·03
1894	− 7	− 1·83	− 1·20	− 2·81
1895	− 3	+ 0·53	+ 0·72	+ 2·86
1896	+ 8	+ 4·30	+ 5·08	+ 13·79
1897	+ 15	+ 1·64	+ 5·58	+ 5·96
1898	+ 6	− 1·67	+ 3·66	+ 1·38
1899	+ 13	—	+ 5·12	+ 7·32
1900	− 7	—	− 0·73	− 4·57
1901	− 21	—	− 4·89	− 11·34
1902	− 3	—	− 0·73	− 2·06
1903	− 1	—	− 0·49	− 1·20
1904	− 2	—	− 1·71	− 1·81
1905	+ 1	—	− 1·22	—
1906	+ 5	—	− 0·24	+ 2·13
1907	+ 2	—	—	+ 1·22
1908	− 17	—	− 4·62	− 9·39
1909	− 6	—	− 1·70	− 5·97
1910	+ 9	—	+ 2·42	+ 3·57
1911	+ 16	—	+ 4·58	+ 6·16
1912	− 3	—	+ 0·24	− 1·71

Col. 1 = Net Revenue, £00000.
Col. 2 = Ratio Net Revenue to Total Paid-Up Capital (including Nominal Additions), per cent.
Col. 3 = Ratio Net Revenue to Total Paid-Up Capital (excluding Nominal Additions), per cent.
Col. 4 = Average Rate of Dividend on Ordinary Capital (United Kingdom), per cent.

Source: Annual Railway Returns.
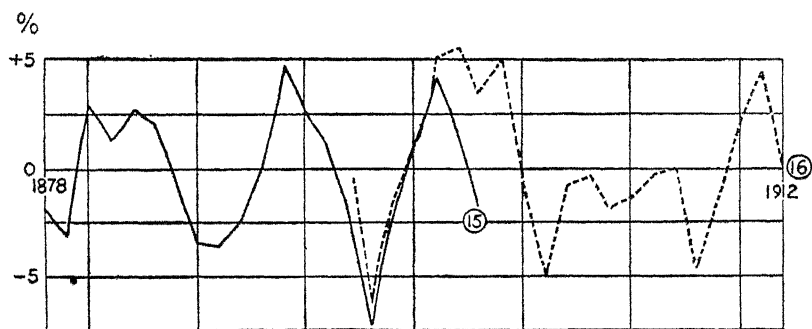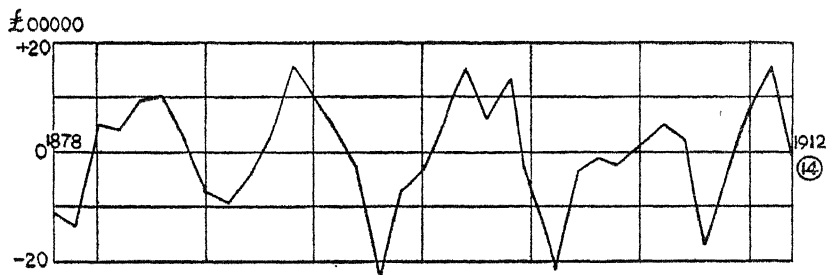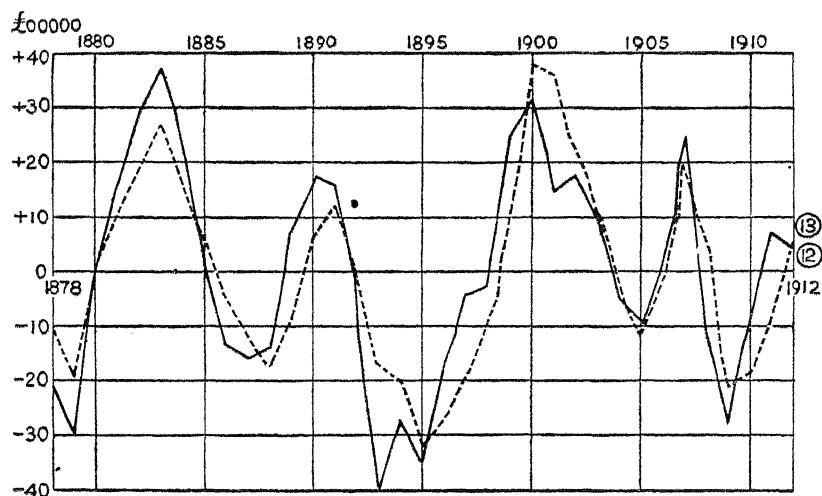
RESIDUAL CYCLES.

Curve 12 = Total Gross Railway Revenue, £00000.
       13 = Total Gross Railway Expenditure, £00000.
       14 = Net Railway Revenue, £00000.
       15 = Ratio Net Receipts to Paid-Up Capital (including Nominal Additions), Per Cent.

years respectively. Maxima occurred in 1883, 1889, 1897, and 1906, of which the second and last preceded gross revenue by one year and the third by three years.

If coefficients of correlation are computed for the different amounts of lag between net profits, on the one hand, and gross revenue on the other, one can normally obtain a reasonable measure of the most "appropriate" time relationship between the different series; but in the case of those under review, it is clear that there is nothing approaching a regular lag of gross compared with net revenue. For one cycle the lag is different from that in another, and for one part of the same cycle the lag is different from that in another part. Coefficients of correlation would therefore give results which are little better (indeed, probably worse, on account of their seeming concreteness) than those which can be obtained from a cautious visual study. The main conclusion is that lag existed as between net and gross revenue. Why?

It is not possible to secure incontrovertible proof of the fundamental cause of this phenomenon, not only on account of the paucity of reliable data, but also because it was probably the result of a combination of causes. Sir Josiah Stamp has, however, given a hint as to the chief (probably not the only) source of disturbance—coal. If, as he suggests, coal was such an important factor, its influence should, I think, have been manifested in that type of expenditure classified for so many years in the official returns as "Locomotive Power," as the major part of coal consumption is normally due to locomotive running. By assuming that all expenditure *other* than that on Locomotive Power remain cyclically stable over the period 1878–1912, and deducting the cycles of Locomotive Power expenditure from those of total gross revenue, we can test whether or not the disturbance was due chiefly to expenditure which fell largely under this head; and by then making the same assumption with regard to Locomotive Power expenditure, we can obtain a useful check. The results of this experiment are reproduced in Table 4 and Curves 18

CHART IV
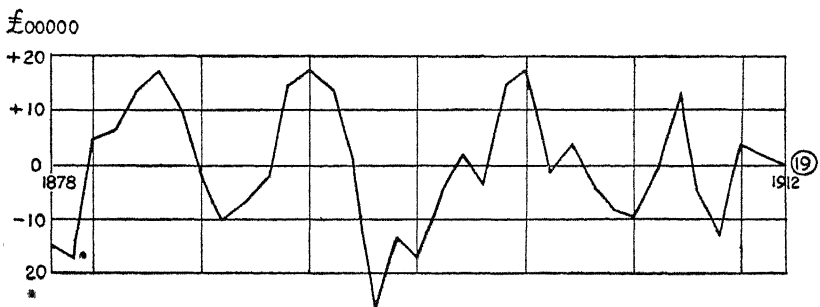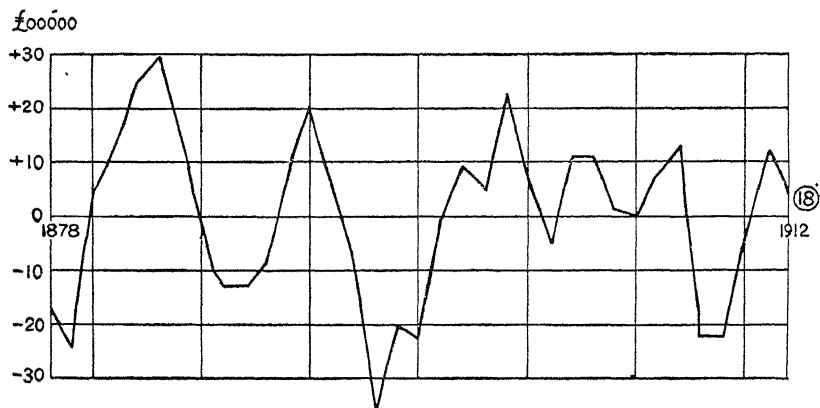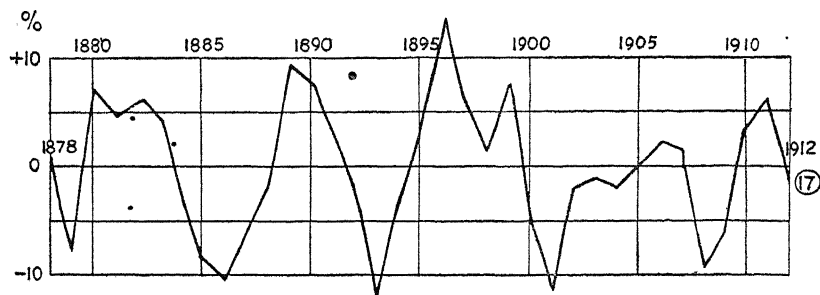
RESIDUAL CYCLES

Curve 17 = Average Dividend on Ordinary Capital (United Kingdom), Per Cent.
    18 = Experimental Net Revenue on Assumption (*a*), £00000.
    19 = Experimental Net Revenue on Assumption (*b*), £00000.

and 19.[1] In a word, they suggest that the cause of irregularity of net revenue acted largely through Loco-motive Power expenditure.

TABLE 4

Great Britain: Experimental Net Revenue on the Assumption—
(a) that Locomotive Power Expenditure alone Fluctudted;
(b) that all Expenditure other than on Locomotive Power
Fluctuated in the Years 1878–1912.

Year	(a) £00000	(b) £00000	Year	(a) £00000	(b) £00000
1878	− 17	− 15	1896	− 1	− 4
1879	− 24	− 17	1897	+ 9	+ 2
1880	+ 5	+ 5	1898	+ 5	− 3
1881	+ 13	+ 6	1899	+ 23	+ 15
1882	+ 25	+ 14	1900	+ 8	+ 17
1883	+ 30	+ 17	1901	− 5	− 1
1884	+ 15	+ 11	1902	+ 11	+ 4
1885	− 4	− 3	1903	+ 11	− 3
1886	− 13	− 10	1904	+ 1	− 8
1887	− 13	− 7	1905	—	− 9
1888	− 8	− 2	1906	+ 8	− 1
1889	+ 10	+ 15	1907	+ 13	+ 13
1890	+ 20	+ 17	1908	− 22	− 6
1891	+ 5	+ 14	1909	− 22	− 13
1892	− 7	+ 1	1910	− 3	+ 4
1893	− 36	− 27	1911	+ 11	+ 2
1894	− 20	− 14	1912	+ 2	—
1895	− 22	− 17			

Source: Annual Railway Returns.

Now the term Locomotive Power covered many types of expenditure other than coal (wages, materials, etc.), but a useful tentative check on the validity of the generalisation can be secured as follows: It was the custom of the Board of Trade, between 1889 and 1912, to analyse the private accounts of some fifteen companies (whose total expenditure was about 84 per cent. of that for all

[1] For those who wish to work back to the crude data as a check, the two formulae used for trend elimination in regard to "Locomotive Power" and "All Other Expenditure" are:—

$$y = 1336 + 57\cdot5x + 0\cdot351x^2 - 0\cdot0693x3 \quad (\pounds0000)$$
$$y = 358 + 12\cdot65x + 0\cdot155x^2 - 0\cdot01207x3 \quad (\pounds00000)$$

railways), and it is fortunate that the figures thereby obtained included the item given in the fifteen companies' accounts as expenditure on locomotive coal. This did not include the amount of coal consumed other than by locomotives, and only represents a sample of all companies. The former omission cannot be remedied, but the latter has been overcome by multiplying the expenditure of the fifteen companies on locomotive coal in each year by the fraction obtained for each year on dividing the total expenditure of all companies by the total for the fifteen. This gives an *estimate* of the cost of locomotive coal to the railways of Great Britain, 1892–1912, which has been deducted from the actual expenditure on Locomotive Power in order to obtain a figure for the remainder of the expenditure under that head. The two resultant series have been subject to trend elimination with the respective formulae:—

$$y = 567 + 19 \cdot 79x - 0 \cdot 76x^2 \quad (\pounds 0000)$$
$$y = 1181 + 30 \cdot 66x - 1 \cdot 049x^2 \quad (\pounds 0000)$$

the residuals being left as absolutes in Table 2, and charted in Curves 8 and 9.

Estimated coal costs clearly revealed two complete cycles with minima in 1897, 1905, and 1911, and maxima in 1900 and 1908, though the residue of the expenditure on Locomotive Power had somewhat different turning-points in 1895, 1900, 1905, 1907, and 1910. It will be observed, however, that the average swing of locomotive coal expenditure, as between boom and depression, was £1·95 M compared with a corresponding figure of £0·91 M for the remainder of Locomotive Power expenditure, so that no doubt remains as to the greater importance of the former.

Expenditure on coal for locomotive purposes is a function of two variables, the amount consumed, and the price paid for it, and the final problem remains of determining their respective weights in bringing about the irregularity of net revenue. Average pit-head prices can be obtained over the years 1892–1912,[1] but it is not

[1] Vide *Mineral Statistics*, published by the Home Office.

known whether the railways paid at these rates. Indeed, it was common for them to enter into long-period contracts, and there was thus probably greater stability of price in regard to their purchases than for ordinary buyers. One thing is clear, however. The minima of the expenditure on locomotive coal were 22·03, 10·67, and 5·01 per cent. below trend ordinates. The maxima were 31·34 and 14·11 per cent. above. Thus the average fluctuation was through 34·82 per cent. of trend. Coal consumption, on the other hand, in the short period, should not have tended to vary very much more than train-mileage, which is the basic indicator of the way in which it is consumed, and it has already been proved[1] that train-mileage fluctuated only to a small extent. The governing factor in coal expenditure must have been its price, though its exact weight cannot be assessed.

For these reasons, one seems justified, within limits, in accepting Sir Josiah Stamp's hint. It is less easy to accept his negative correlation between profits and output, which stretches the lagging relationship to excess. On the whole, however, one cannot doubt the importance of coal prices in helping to bring about the irregular movement of profits relative to gross revenue, though they were not the only factor in the situation.

When the amplitude of the net revenue fluctuations is considered a little caution is needed. In terms of absolutes the minima were respectively £1·3 M, £0·9 M, £2·3 M, £2·1 M, and £1·7 M below trend, and the maxima £1·0, £1·6 M, £1·5 M, and £0·5 M above, the average movement, as between boom and depression, being £2·8 M. The average, it will be noted, is appreciably less than the corresponding figure obtained for gross revenue. But when it was stated that there is normally a tendency for net to fluctuate more violently than gross revenue, we were thinking in terms, not of *absolute* figures, but of *percentages*, because it is manifestly impossible for the absolutes to be greater when gross revenue and expenditure have more or less the same

time-incidence. The percentage deviations of the minima were 4·38, 2·75, 6·42, 5·29, and 3·90 per cent. respectively; those of the maxima 3·18, 4·72, 3·99, and 1·18 per cent.; whilst the average swing, as between boom and depression, was 7·82 per cent. of trend. The theoretical tendency for net to vary more than gross revenue thus appears to work out perfectly. There is, however, something in the nature of an accident in the degree of difference between the fluctuations of the two, because, as we know, their movements do not coincide perfectly, and this is a necessary condition for the application of the static theory. By appropriate lagging of one series after another, even though they were identical, one could vary the degree of fluctuation manifested by their difference quite violently.

Profits are usually expressed, not as absolutes, but as rates on invested capital, and, in order to bring the analysis into line with practice, it is necessary to calculate these rates of return. The best index is the ratio of net revenue to total paid-up capital. Admittedly paid-up capital, even theoretically, does not represent anything in the nature of a valuation of railroad property in the sense used by the Interstate Commerce Commission of the United States, because original cost, present cost of reconstruction, etc., are not represented, but it is the only serviceable guide which we have available. In practice, too, the rate of return is obscured, at least in the early years, by the existence of large nominal additions. The extent of these, in the years preceding 1888, with the exception of 1876 and 1886,[1] was not great, but between 1888 and 1896 it reached large proportions.[2] In order to overcome this difficulty, it has been possible to eliminate the effect of nominal additions during the period 1892–1912, and the rate has been calculated on total paid-up capital, *exclusive* of all nominal additions. Figures were not given before 1890, however, so that

[1] Evidence to Departmental Committee on Railway Agreements and Amalgamations, Ques. 162, Appendix IV.

[2] C. C. Wang: *Legislative Regulation of Railway Finance in England,* p. 126.

in the earlier period the rate has to be calculated on total paid-up capital, *inclusive* of nominal additions. In order to secure some overlap, the figures (Table 3) are divided into two periods, 1878–1898, and 1892–1912, the former including and the latter excluding nominal additions. The trend eliminating formulae are:—

$$1878\text{–}1898 \quad y = 4\cdot08 - 0\cdot0356x - 0\cdot0012x^2$$
$$1894\text{–}1912 \quad y = 4\cdot09 - 0\cdot0012x + 0\cdot0009x^2$$

In each case deviations of the crude data have been expressed as percentages of secular trend. Illustrative curves are 15 and 16.

That the fluctuations follow net revenue movements, even the pecularity of the material cannot disguise. In the first period, admittedly, the maximum of the rate of return occurs in 1880, whereas the maximum of net revenue occurs in 1883. But it can be seen that the net revenue curve has a flex in 1880, showing what might be called a "potential" maximum, whilst the curve of the rate of return has a secondary maximum in 1882, and a rather "blunt" series of peaks about the maximum. For these reasons it would be somewhat rash to attach too much significance to the divergences of the two curves, though some of the difference between their respective courses is undoubtedly real (in the sense that it is not due to the mathematics of curve-fitting, etc.). In the second period there is equal closeness of movement.

As to amplitude, in the first period the minima were 2·79, 3·37, and 7·24 per cent. below, and the maxima 3·04 and 4·70 per cent. above, trend, thus averaging a movement of 8·34 per cent. In the second period, the minima were 6·23, 4·89, and 4·62 per cent. below, and the maxima 5·58 and 0·0 per cent. above, trend, covering, as between boom and depression, an average of 8·04 per cent. If one assumes that the results from the two periods can be averaged, the degree of movement over the years 1878–1912 was 8·19 per cent., or slightly more than the figure obtained from pure net revenue sources. Whilst these deviations of the rate of return

are seemingly large compared with gross revenue, they are really much smaller than in most industries. Those in which the return to capital varied less than on the railways are relatively few.

The ratio of net revenue to total paid-up capital is the most important factor, especially for the purpose of studying the standard revenue provisions of the Railways Act, 1921, but it includes interest on fixed interest bearing securities (loans and debentures) as well as on prior-claim capital in the form of preference shares, etc. The real risk-bearers are the ordinary shareholders, on whom the brunt of fluctuations in either direction falls. As Hadley first showed, slight fluctuations in revenues have much more than proportionate effects on the profits available to the stockholder, and even an industry so eminently stable as railway transport can suffer violent changes of fortune if measured by ordinary share dividends. In order to illustrate the truth of this, Table 3 gives the cyclical fluctuations of the average rate of interest on ordinary capital in the United Kingdom.[1] The trend eliminating curve is of the form:—

$$y = 3\cdot84 - 0\cdot075x + 0\cdot00021x^2 + 0\cdot000176x^3$$

and the residuals, expressed as percentages of trend, are charted in Curve 17.

It needs no detailed description to prove that the curve follows that of net revenue and the ratio of net revenue to total paid-up capital extremely closely, even though fitted differently than the latter. The only feature of interest is to compare the degree of fluctuation with the other two net revenue items. Expressed as percentages of trend, the minima were $8\cdot01$, $10\cdot45$, $12\cdot03$, $11\cdot35$, and $9\cdot39$ per cent. below trend, and the maxima $6\cdot79$, $9\cdot39$, $13\cdot79$, and $2\cdot13$ per cent. above, the average fluctuation being one of $18\cdot27$ per cent. These elementary calculations show, without doubt, that the fluctuations of the return on the ordinary stocks and shares were far

[1] Figures for Great Britain cannot be obtained.

more violent, relatively speaking, than the return to capital. In this respect, of course, the limitations already mentioned for the static laws in regard to the greater variation of net compared with gross revenue do not apply, and the result is free from spuriousness. Nevertheless, when these figures have been given, it does not follow that actual dividend rates represent the amount available each year for dividend payments. It is clear that, in so far as reserves had a stabilising influence, actual rates are probably conservative indices of the current residues. This fact is particularly clear in the post-war years, as will be shown later, and it is almost certain that the same tendency operated in the period 1878–1912. A conservative appraisal of the position, however, always has virtue.

(4)

So far, the analysis has been made entirely in terms of profits and the influences which bore upon them over the period under review. Whilst there were undoubted statistical difficulties, even in regard to the reward of the capitalist and the entrepreneur, they loom even larger in any assessment of the effect of trade fluctuations on the other chief factor of production—labour. It is possible, however, with a generous allowance for the nature of the figures, to obtain some idea of changes in wage rates by reference to two sources, one concerning average earnings and the other the expenditure of certain companies on certain kinds of labour.

Of railway wage scales there is really little information of a continuous nature.[1] Apart from returns in 1886, 1891, and 1906, which were in themselves comparable with difficulty, there exist merely some figures of earnings, collected by the Board of Trade from 1896 onwards from voluntary information supplied by certain companies. As a rule, the remuneration of railway men was

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[1] Rowe: *Wages in Practice and Theory*, Appendix I.

regulated by graduated scales of pay,[1] and, at the same time, continual alterations took place in the nature and amount of work to be done by individuals, so that it was difficult to discover the number of persons whose rates of remuneration, for the same work, had been changed in any year. The Board therefore procured the figures of the total number of workpeople (exclusive of clerical staff and salaried officers and also certain persons casually employed for less than three days during the week) employed in their coaching, goods, locomotive, and engineers' departments, and also the total amount of wages paid to those people in the first week in December of each year.[2] The latter was divided by the former to give earnings for the week, which were influenced each year by real changes in the rates of pay, ordinary advances under existing scales, and overtime or short time. Thus the figures cover earnings, not rates; they refer only to one week; they omit extra earnings of porters, uniforms, and allowances; they are influenced by grading, so that the average may rise on account merely of movement between grades; and they are collected from only twenty-seven companies, though these employed 90 per cent. of the total number of railway servants in the United Kingdom. From them, however, with reasonable caution, one can obtain some idea of movements of wage rates, because they are normally less than those of earnings,[3] and one can compare changes in real and money incomes, though not the absolute amount thereof. The statistics for England and Wales (exclusive of Scotland) are collected in Table 2 in the form of percentage deviations, after trend has been eliminated with the formula:—

$$y = 25 \cdot 76 + 0 \cdot 126x \quad \text{(shillings)}$$

They are charted in Curve 10.

[1] Board of Trade *Abstract of Changes in Rates of Wages and Hours of Labour in the United Kingdom in 1912*, pp. xxxv et seq.

[2] Except in 1903, when the second week was chosen, owing to a heavy fog in the first.

[3] Rowe: *Wages in Practice and Theory*.

From the chart it is clear that there is a shortage of years to include two complete cycles, and, in so far as the secular trend line is affected by the amount of cycle in the period taken, there is a certain amount of inaccuracy in the measurement, which ought normally to cover complimentary stages for the purpose of ·trend elimination. When all these limitations of the crude data, and even of the statistical methods, have been mentioned, it is difficult to arouse any great respect for the results of the analysis, but at least two propositions seem reasonable. The first is that there is a general coincidence of movement between railroad earnings and gross expenditure, such slight differences as exist being merely minor details which it would· be folly to explain in view of the limitations of the data. This phenomenon is, of course, normal to any industry, but it is a little peculiar for the railways because they enjoyed a semi-monopoly demand for the labour they employed. The forces of competition cannot be said to have played with such intensity as in other trades. Very few men would change their occupation because higher wages were offered elsewhere, unless the increases were sufficiently large to outweigh the losses of permanent employment, pensions, and other amenities of the service, and the railways have rarely had difficulty in getting new men at the old-established rates. That earnings (and presumably wage rates) were in fact affected by the cycle is evidence enough, however, to support the view that some market influences, direct or indirect, were able to make themselves felt. It is even conceivable that the earnings average shows lower in booms and higher in depressions than would be the case for the well-established men, because the increase of new men in the former (beginning at the bottom of the established scales of pay), and the falling off of new employees in the latter, tends to cause an evening out of the natural fluctuations.

The second proposition is that the amplitude of the fluctuations of the price paid for labour was very much less than the amplitude of the return to capital. This can

be tested by a review of the individual percentage devia-
tions from trend of the two series.

These results are broadly confirmed by a more com-
plicated calculation. Reference has already been made to
the Board of Trade's customary analysis of the private
accounts of fifteen companies between 1889 and 1912.
In the published figures were shown the sums expended
by these companies on wages in the permanent way,
locomotive repair, renewal of carriages and wagons and
traffic departments. These, however, covered only part
of the total wages costs of the fifteen companies, and,
in any case, did not include all British railways, though
the sample fifteen accounted for about 84 per cent. of
total railway expenditure. In order to remedy the former
difficulty, use has been made of a table on p. 121 of the
Balfour Committee's *Report on Further Factors in In-
dustrial and Commercial Efficiency*. This table shows the
total "wages" and "other" expenditure for the whole
undertakings, including ancillary works, in 1913, of the
railways constituted by the Railways Act, 1921. The
total, however, appears to omit the "collection and
delivery of parcels and goods." The item has been added,
and the proportions of "wages" and "other" expenses to
this new total have been calculated. It has been assumed
that the same proportions hold for the previously men-
tioned companies for 1912. Having estimated, on this
basis, the total wage bill for 1912, it was found that the
Board of Trade figures amounted to about 63 per cent.
thereof. For each year, back to 1892, a calculation of the
actual total wages costs has been made by multiplying
this estimate of total wages cost for 1912 by an index
obtained from the wages figures given by the Board of
Trade for the fifteen companies. In order to remedy the
latter limitation and find the corresponding costs for the
railways as a whole, the total wages figures of the fifteen
companies, estimated in this manner, have been multiplied
in each year by the percentage which the total expenditure
of all companies bore to the expenditure of the fifteen
companies for that year. The result is an *estimate*, in the

form of an *index* rather than actual figures, of the total
wages costs of the railway companies of Great Britain,
1892–1912. Trend has been eliminated in Table 2 by
means of the formula:—

$$y = 3835 + 87 \cdot 1x - 3 \cdot 08x^2 \quad (\text{\textsterling}0000)$$

and the residuals (Curve 11) have been expressed as
percentages.

According to the chart, minima occur in 1895; 1906,
and 1909, with intermediate maxima in 1900 and 1907,
and these clearly differ somewhat from those obtained
for average earnings. Assuming, however, that con-
sideration of the amplitude of fluctuation is of more
importance than slight deviations of time-incidence,
it is valuable to observe that the average difference
between maxima and minima is only a matter of 5·48 per
cent. When one considers that part of this was due,
not to wage rates, but cyclical changes in the number of
men employed, which must, according to available traffic
indices,[1] have accounted for a very large portion of the
5·48 per cent., one is confirmed in contrasting the
difference compared with the return to capital. Stability
was perhaps one of the most impressive characteristics
of British railways in the period under examination, but
there were not many ways in which it was more pro-
nounced than in wage rates.

(5)

Apart from the detail of reaction, then, the three main
groups of people interested in railway transport were
differently affected by cyclical trade fluctuations over the
years 1878–1912. Most stable of all, on the assumptions
of Sir Josiah Stamp, were the rates and fares charged to
the consumers of the product. Close at heel came the
wages paid to railway labour. And, lastly, came the

[1] Annual figures of the number of men employed are not available. Vide,
however, "The Business Cycle and Accidents to Railway Employees in the
United States," by C. Douglas Campbell, *Jnl. Amer. Stat. Soc.*, September 1931.

returns to capitalists (including in this term the capitalists proper and the entrepreneurs) who apparently bore most of the burden. Simple as these generalisations are, they differ somewhat from the average of industries, the prices of whose products fluctuated cyclically to an appreciable extent, and they bear an important contrast to certain implications of the Railways Act, should these ever be rigidly carried out.

THE POST-WAR DEPRESSION, 1913–1930

BEFORE the war, apart from random fluctuations, the trade cycle was ordinarily the chief cause of variations in the prosperity of British railways, though, as has been shown, the relation of their profitability to general trade movements was not perfectly constant. Following the war, conditions were less normal. During 1919 and part of 1920 there was an artificial trade boom of unprecedented magnitude, but from the latter onwards business remained at a generally low level relative to that of pre-war years. It is true that some of the years between 1921 and 1930 were better than others. Thus, the unemployment percentages, collected in Table 5, reveal that there was an improvement roughly between 1921 and 1924, followed by a decline to 1926, a further period of rising employment up to 1929 and a severe recession in 1930. These were definite alterations in trade conditions, but they were changes about a level of prosperity much lower than before the war, and they were not always of a cyclical nature. Coal strikes affected 1921 and 1926, not to mention the years immediately following them, owing to postponed production being concentrated in the ensuing period; whilst damage to French and Belgian mines and the occupation of the Ruhr stimulated British output in 1923–24 in a way that was purely artificial and random.[1] The reaction of railway goods traffic to these peculiar industrial movements was naturally quite close, but dare we say that they were normal? Whether they were or not need not detain us. The most important alteration requiring analysis is the change in the general level of prosperity in the average of years since, compared with that before, the war.

We have first to face the problem of what years ought

[1] *Report of Committee on Finance and Industry*, 1931, Cmd. 3897, p. 48.

to be compared to give a generalised view of the situation. It is easy to choose those which leave scope for criticism, because so much depends on discretion in presenting the facts. In order to secure the most useful analysis, with complete information available and no random trade

TABLE 5

Great Britain: Percentage of Unemployment, (a) Trade Union,
(b) Insured Persons, (c) First Differences of (b).

1 Year	2 (a)	3 (b)	4 (c)
1913	2·1	—	—· —
1914	3·3	—	—
1915	1·1	—	—
1916	0·4	—	—
1917	0·7	—	—
1918	0·8	—	—
1919	2·4	—	—
1920	2·4	—	—
1921	14·8	17·0*	—
1922	15·2	14·3	— 2·7
1923	11·3	11·7	— 2·6
1924	8·1	10·3	— 1·4
1925	10·5	11·3	+ 1·0
1926	—	12·5*	+ 1·2
1927	—	9·7	— 2·8
1928	—	10·8	— 1·1
1929	—	10·4	+ 0·4
1930	—	16·1	+ 5·7

* Excluding coal-miners disqualified from benefit.

Source : (a) Abstract of Labour Statistics.
(b) Royal Economic Society: *Report on Current Economic Conditions*, January 1931, p. 14.

conditions at work, the best procedure is to compare the position of the "Big Four" over the years 1913 and 1930. The former was a good pre-war year; the latter represented the lowest ebb of the tide for the investor since 1922, and enables comparisons to be made with the standard revenue fixed under the terms of the Railways Act, which was based largely on 1913 figures. It also gives the analysis more topical interest by virtue of the

fact that 1930 is the last year for which complete material is available.

The most obvious manifestation of the decrease in railway prosperity in 1930 compared with 1913 was in the decline in the margin available for the payment of interest and dividends. From Table 6 it is quite clear

TABLE 6

Great Britain: Gross Revenue, Gross Expenditure, and Net Revenue of the "Big Four," 1913 and 1930, (£M)

	1913	1930	Change, Per Cent.
Total Receipts	129·1	196·5	+ 52
Expenditure :—			
Salaries and wages	47·0	109·2	+ 133
Materials	26·6	37·4	+ 41
Rates, taxes, and National Insurance	5·3	7·6	+ 42
Sundry items (less miscellaneous receipts)	5·0	4·7	— 7
Total	83·9	158·8	+ 89
Net Receipts available for interest and dividends	45·2	37·7	— 17

Source: *Railway Newsletter*, Vol. 3, No. 7, July 1931.

that, on the basis of the accounting system there used, this margin was less by 17 per cent. in 1930. On the other hand, it does not follow that actual dividend payments declined so greatly. Indeed, according to calculations made from the *Annual Railway Returns*,[1] the actual appropriations for interest and dividends were £43,869,749 in 1913 and £39,634,090 in 1930, a decline of only 10 per cent. as between the two years. Still another way of looking at the figures is to compare the actual net revenue of 1930 with the standard allowed under the Railways Act, 1921. This (Table 13) shows a

[1] *Annual Railway Returns*, 1923, p. 29, and *Annual Railway Returns*, 1930, p. 33.

deficiency of 25·8 per cent. When it is recalled, however, that the standard revenue makes allowance for capital invested or coming into use after 1913, for economies under the Act, etc., the divergence compared with the other calculations appears quite consistent and is not due to inaccuracy of compilation.

If these were the effects of the railway situation, what were the causes? A number of publications, describing the statistical details of the comparative position, have appeared of recent years, and there is no need to develop this side of the matter at great length. It is, therefore, proposed to give but few facts and to turn analysis for a moment into somewhat new channels.

On the demand side, the statistics of Table 7 prove

TABLE 7

Great Britain: Physical Volume of Railway Transport on the "Big Four,"
1913 and 1930

	1913	1930	Change, Per Cent.
Goods Traffic Originating :—	(M Tons)	(M Tons)	
General merchandise	65·7	51·2	— 22·1
Coal, coke, and patent fuel	221·3	186·2	— 15·9
Other minerals	69·9	56·1	— 19·7
Total	356·9	293·5	— 17·8
Passengers Originating :—	(M)	(M)	
Ordinary tickets	680·7	575·1	— 15·5
Season tickets *	304·2	379·4	+ 24·7
Workmen's tickets	187·7	214·6	+ 14·3
Total *	1172·6	1169·1	— 0·3

* Calculated by equating the number of season tickets to an annual basis and assuming 600 journeys per annum.

Source: *Annual Railway Returns,* 1923 and 1930.

that the total tonnage of goods traffic originating in 1930 was 17·8 per cent. less than in 1913, whilst the decreases for general merchandise, coal, and other minerals were 22·1, 15·9, and 19·7 per cent. respectively.

The passenger statistics in the same table are less reliable, and need to be approached with great caution on account of three limitations:—

(*a*) They are not passenger-miles, the more ideal units, and hence do not show whether there has been an increase in the average distance travelled by the public. Owing to motor competition at the shorter distances, the spreading out of cities, and the tendency for people to move farther afield for their enjoyment, it seems probable that the average distance travelled was greater in 1930.

(*b*) They contain a rather arbitrary element in the estimated number of journeys taken by season-ticket holders. These are calculated by the Ministry of Transport on the assumption that the average number of journeys taken on an annual ticket, to which all tickets are equated, is 600.

(*c*) As between the various classes of ordinary, season-ticket, and workmen's journeys there may have been a large element of interchange. For example, the decrease in ordinary tickets between 1913 and 1930 may be accounted for, partly, by the increase in season tickets, or workmen's tickets, and so on.

It would, therefore, not be safe to generalise on the basis of such unreliable material without knowing that the results may be subject to qualification. Nevertheless, if the conclusions are accepted with as much caution as they are given, it may be said that ordinary traffic declined 15·5 per cent., whereas season and workmen's ticket travel actually increased by 24·7 and 14·3 per cent. respectively, thus causing total traffic to decline only by a small matter of 0·3 per cent. The insignificance of the last figure, however, should be tempered by the knowledge that the decline of ordinary traffic is the most important feature, not only because the latter accounts

for the largest part of total passenger revenue,[1] but also because ordinary passenger travel averages a distance of 16·2 miles, compared with averages of 11·4 and 6·77 for season-ticket holders and workmen respectively.[2]

Now, whilst a general tendency to decrease is to be noted for traffic volume, gross revenues lead to a different conclusion. According to Table 8, gross receipts from

TABLE 8

Great Britain: Gross Revenue from Goods and Passenger Traffic, 1913 and 1930 on the "Big Four"

	1913 (£M)	1930 (£M)	Change, Per Cent.
Goods Traffic:—			
General merchandise	30·3*	45·5	+ 50
Coal, coke, and patent fuel	22·2	34·6	+ 56
Other minerals	8·7	14·6	+ 68
Total	61·2	94·7	+ 55·
Passenger Traffic:—			
Ordinary	35·7	45·6	+ 28
Season ticket	4·3	8·3	+ 93
Workmen	1·3	3·1	+ 138
Total	41·3	57·0	+ 38

* Estimated. The method of accounting was changed by the Ministry of Transport in 1928 (Vide *S.R.O.*, 1928, No. 1041, and *Annual Railway Returns*, 1928, p. 2) and, in order to put the figures on a comparable basis with 1930, an estimate has been made by a comparison of the 1927 statistics on the new and old methods. The change also affected coal, coke, patent fuel, and other minerals, but this was so slight that no correction appeared necessary in broad figures.

Source: *Annual Railway Returns*, 1923, 1927, and 1930.

general merchandise, coal, and minerals were greater by 50, 56, and 68 per cent. respectively, the increase of the traffic as a whole amounting to 55 per cent.

In the passenger department, receipts from ordinary passengers, season-ticket holders, and workmen were greater by 28, 93, and 138 per cent., whilst the revenue

[1] Vide Table 8.   [2] *Annual Railway Returns*, 1930, p. 130.

as a whole increased by 38 per cent. It remains to reconcile these facts with the constant complaints made by the railway companies of the effect of trade depression and motor competition.

Of trade depression there is evidence enough in the unemployment percentages and the reduced volume of traffic. The growth of motor competition certainly cannot be denied. No known method of calculation can yield any better measure of its development over a number of

TABLE 9

United Kingdom: Numbers of Certain Types of Motor Vehicles in Use.

1 Date	2 Private Cars	3 Hackneys	4 Trucks
March 31, 1913* — ..	105,734	38,544	63,600
Highest Quarter, 1922	319,311	79,738	161,008
Highest Quarter, 1923	389,767	88,747	183,895
Highest Quarter, 1924	482,356	97,489	213,137
Highest Quarter, 1925	590,156	102,674	236,038
Census, September 1926 ..	695,555	104,444	261,647
Census, September 1927 ..	800,112	98,597	288,015
Census, September 1928 ..	900,557	97,366	311,410
Census, September 1929 ..	998,489	99,645	336,122
Census, September 1930 ..	1,075,081	102,791	354,948

* Excluding Northern Ireland.

Source: *The Motor Industry of Great Britain*, 1931 ed.

years than mere figures of the number of vehicles in existence at different dates, which are, admittedly, largely a matter of conjecture, and poor substitutes for even the most elementary statistics obtained from the railways. The three most important competitors with the railways are private cars, hackneys (i.e. motor-buses, charabancs, and cabs), and trucks, for each of which the Society of Motor Manufacturers and Traders gives the statistics of Table 9 for the years 1913–1930. The figure for 1913, extracted from H.M. Customs and Excise reports, excludes Northern Ireland, and the column headed "trucks" is an estimated figure for that year computed

from the proportional trend of trucks to private cars projected back from 1920–1928. From 1922 to 1930 the more complete records of the Ministry of Transport and the Ministry of Foreign Affairs for Northern Ireland have been drawn upon. It would be rash to claim any great degree of accuracy for the comparison between 1913 and 1930, but there is no need to emphasise the great growth of about 917, 167, and 451 per cent. respectively for cars, hackneys, and trucks.

To put this growth into its proper perspective, however, it is necessary to recall a number of considerations. The first is that much of the increase has been at the expense of canal, tramway, and horse transport, and hence does not represent a net deduction from the railways. It is, indeed, common knowledge that these other forms of transport have suffered, but few investigators relate this to the railway position. Tramway and horse haulage have probably suffered more than railways, because of the shorter average travelling distance. Tramways, moreover, are concerned entirely with passenger transport,[1] and it is in this direction that the motor has made most progress. There is no exact way in which the relative decline of traffic due to the progress of the motor can be measured, but few will deny that railways have not suffered more than trams, horse-lorries, and canals.

The second consideration lies in the fact that the greater increase is in passenger vehicles, so that, despite the relatively greater decline of railway-goods traffic, competition seems to be keener in this direction. At times the evidence of congested streets and the publicity given to motor developments seem to have obscured the relative proportion of goods and passenger traffic passing by road and rail respectively, and it is, indeed, impossible to get any satisfactory measure. The only known method is that adopted by the Society of Motor Manufacturers and Traders in its annual publication, *The Motor*

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[1] With the minor exception of certain systems (Huddersfield, for example) which convey some goods, and always subject to the relatively small amounts of parcels traffic carried on most systems.

Industry of Great Britain.[1] The Society proceeds on assumptions which are easy to criticise (but hard to replace), and its results are probably subject to a fairly large margin of error. Nevertheless, the conclusions fit in so well with *prima facie* arguments, and are so well defined, that the broad view will meet with some approval. In a word, they show that motor transport passenger-mileage in 1930 was as great again as railway passenger-mileage, whilst goods ton-mileage was only about a quarter of that on the railways.

The third point is that motor transport, at the present time, is more effective at the shorter distances. Table 10,

TABLE 10

Great Britain: Receipts from Passengers (other than Season-Ticket Holders and Workmen) at Certain L.M. & S.R. Stations.

1	2	3	4
Mileage Gradation	Receipts		Increase (+) or Decrease (−), Per Cent.
	1923 (£000)	1927 (£000)	
1 to 10	886	649	− 27
Over 10 up to 20	1,253	962	− 23
Over 20 up to 50	2,690	2,450	− 9
Total	4,829	4,061	− 16
Over 50 up to 100	1,609	1,640	+ 2
Over 100 up to 200	2,060	2,147	+ 4
Over 200	2,278	2,293	+ 1
Total	5,947	6,080	+ 2

Source: *The Railway Industry of Great Britain,* 1927, by C. E. R. Sherrington and W. V. Wood, Royal Economic Society.

for example, shows the result of an analysis of the receipts in 1923 and 1927, from passengers other than season-ticket holders and workmen, between all pairs of London, Midland, and Scottish stations, where the receipts at

[1] Edition of 1930, pp. 26–7.

the originating station were £100 or over in July 1923. From it the surprisingly symmetrical result is shown that the shorter the distance travelled, below fifty miles, the greater the loss in receipts. Increases are definitely shown for all traffic exceeding fifty miles in distance. As to goods transport, evidence of the same tendency can be drawn from a report prepared for submission to the International Railway Congress, Madrid, 1930, by Mr. H. L. Wilkinson, Assistant Superintendent of the Line on the Great Western Railway. A summary of the report[1] states that "it is estimated that competing road transport in the area served by one of the British railway companies carries 57·8 per cent. of the traffic between points up to forty miles apart, 18·5 per cent. of the traffic between points over forty miles apart, and 23·7 per cent. of the traffic over wide areas under a comprehensive system of radial distribution by the trader's own fleet."

Finally, it is a matter of concrete experience that heavy low-valued goods, such as coal, are still largely the preserve of the railway. Mr. Wilkinson, in the previously mentioned report, lists "provisions, ales, furniture, bricks and building materials, fruit, flour, grain, paper, oil-cake, manure, timber, wool, cotton, market produce, meat, textiles, sugar-beet, iron and steel, electric cable, and cement," as being "most affected by motor competition at present," Some of these seem to come within the orbit of the term "low-valued," but minerals, coal, and stone, etc., are not among them.

When general trade depression and motor competition have been mentioned, the whole of the factors have not been isolated, however. There are certain changes of industrial structure (taking place in ways sometimes obscure) which are likely to prove even more important in the future. For example, the coal industry, on which the railways depend so much for their bulk traffic, is undergoing something more than an ordinary trade depression. The advent of oil as an effective substitute[2] means that some of the bunker traffic from internal

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[1] *Modern Transport*, October 9, 1929. [2] Cmd. 3897, p. 50.

coalfields has gone for ever, and there is no set-off in the gain of oil traffic, as the raw material is imported from abroad and left at the ports. The insistence of the law of increasing costs prevents British mines from competing in foreign markets with other countries, and the seaward movement of tonnage from the interior hence tends to fall off. The constant shifting of industry, whether it be geographical, as between different areas in Great Britain, or industrial, as between products and processes, also has its effect. The age of construction of foreign railways is declining, and the tonnage of steel rails, locomotives, etc., carried over British railways declines too. These are but a few of the long-period tendencies which affect the physical volume of goods conveyed. "Change" rather than "decline" may be one of the chief characteristics of industry in general, which affect goods-traffic volume in an adverse direction. New lighter commodities are being produced. In short, it is erroneous to assert that ordinary trade depression and motor competition are the only causes of the decline in the physical volume of traffic conveyed over the railways.

Bearing these limitations in mind will only tend to modify one's perspective in regard to motor competition, industrial depression, and change. Other things being equal, their combined effect, working through the physical volume of traffic, would clearly cause gross receipts to be less than in 1913. Two facts explain why the results are otherwise.

In the first place, the general rate level in 1930 was substantially higher than in 1913. Exactly how far it increased it is impossible to say, owing to difficulties of calculation. The ways in which the general rate level is usually measured are two: i.e. by comparison of actual rates charged for specific service between given points through a series of years, and by means of the computation of revenue per ton-mile,[1] and it is not true that these methods will always yield approximately the same results. Briefly, revenue per ton-mile is affected by three

[1] W. Z. Ripley: *Railroads—Rates and Regulation,* pp. 411 et seq.

separate factors, variation in any one of which will produce quite confusing effects on the index. Changes in the nature of the traffic (as between high and low grade) are perhaps the most obvious. Clearly, too, the length of the haul and the proportion of local and through traffic, on account of the tapering principle, are not insignificant influences. Finally, though this concerns the static long period and depends on the assumption of normal profits, the volume of traffic, by causing total expenditure to be spread over a smaller or larger number of units, is important. It is therefore with some diffidence that I expose the argument to attack by making an attempt to gauge the change in rates between 1913 and 1930. Only the desirability of some (rather than no) figure compels resort to questionable calculations.

Ton-mileage receipts are not avilable for 1913, but the Balfour Committee, on the basis of calculations which cannot be tested, stated that the charges in existence at the beginning of 1928, when the standard revenue provisions first went into operation, were "about 60 per cent. above those of 1913."[1] During the calendar year 1928 the average ton-mile receipt for Great Britain was 1·492 pence, compared with 1·426 pence in the calendar year 1930.[2] The latter figure, however, included the sums allowed as rebates under the railway Freight Rebates Scheme.[3] The amount of rebates allowed in the year ending September 30, 1930, on traffic, exclusive of milk (passing largely by passenger train) and live stock, was £3,683,632,[4] whilst the corresponding freight revenue in the calendar year 1930 was £97,602,723.[5] Assuming that the rebates during the calendar year 1930 were roughly the same as those for the year ending September 30, 1930, the ton-mileage receipt for 1930 would have to be reduced by about 3·77 per cent. to 1·372, in order to secure comparison with 1928. If the

[1] *Further Factors in Industrial and Commercial Efficiency,* p. 212.
[2] *Annual Railway Returns,* 1930, p. 27.
[3] Vide Local Government Act, 1929.
[4] *Annual Railway Returns,* 1930, p. 131. [5] *Ibid.,* p. 16.

difference in ton-mileage receipt between 1928 and 1930 is a rough indication of the change in the general rate level (as a result of rebates and the paring away by new exceptional rates) the increase of about 60 per cent., given by the Balfour Committee, would have been reduced to about 47 per cent. in 1930. It is easy to lay too great stress on this figure, of course, but if it is worth anything, it proves that what the companies lost through trade depression, motor competition, etc., was offset by what they gained from an increase in charges. An interesting point to notice in this connection is the fact that wholesale prices, i.e. the prices of the things largely carried by the railways, only increased over the same period by 19·5 per cent.[1]

In the second place, the general level of passenger fares was higher in 1930 than in 1913. The Balfour Committee quotes a similar increase for passenger fares as for freight rates, and, making allowance for subsequent changes by means of the September passenger-mile receipts in 1928 and 1930,[2] it seems possible that fares averaged 51 per cent. greater at the latter date than in 1913. But though this may apply to certain parts of the traffic, it would be unsafe to apply to the whole. Certain classes of passenger traffic, indeed, seem to enjoy rates below the pre-war level.

By combining all the sources of railway revenue we obtain the crude figures of Table 6, which show that gross revenue as a whole increased between 1913 and 1930 by about 52 per cent. It is clear, therefore, since net revenue declined over the same period, that gross expenditure must have increased very much more than gross revenue, and this is, indeed, the case. Table 6 demonstrates that total gross expenditure was 89 per cent. higher in 1930 than in 1913. This remarkable increase needs explaining.

The same table indicates that the source of disturbance

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[1] According to the Board of Trade Index, published in the *Board of Trade Journal*.

[2] *Annual Railway Returns*, 1928, p. 130, and 1930, p. 130.

is to be sought largely in the increase in wages cost, which stood 133 per cent. higher in 1930 than in 1913.

It is possible, moreover, to take a step further and prove that changes in both wage rates and numbers of men employed were the more ultimate causes. To show the former, assuming wage rates not to have been appreciably different in 1913 and 1914,[1] Mr. Rowe's index of wages in the railway service between 1914 and 1926[2] has been continued from calculations based on the Railway Companies (Staff) Returns, as far as 1930, and the figures, though no more accurate than Mr. Rowe claims them to be, are collected in Table 11. At the

TABLE 11

Great Britain: Index of Railway Weekly Wage Rates

1 Date	2 Index (1914 = 100)
July 1914	100
December 1922	225
December 1923	223
December 1924	223
December 1925	227
December 1926	222
December 1927	222
December 1928	214
December 1929	213
December 1930	212

Source: Rowe: *Wages in Practice and Theory*, p. 17.
Railway Companies (Staff) Returns, 1927–1930.

end of 1930 the index was 112 per cent. greater than in 1913.[3] To show the latter, attention may be drawn to the divergence between the index of total wages cost for 1930, which amounted to 233 compared with 1913, and the index of weekly wage rates for the same year, which only touched 212. It would have been useful to

[1] They were lower in 1913 than in 1914.
[2] *Wages in Practice and Theory*, p. 17.
[3] The figures for 1931, of course, will be lower owing to the reductions which came into force after the date on which the above statistics were compiled.

contrast the number of employees at the two dates from information contained in the Railway Companies (Staff) Returns, which give the total for the United Kingdom in 1913 as 643,135 and for Great Britain (i.e. excluding Ireland) in 1930 as 656,530; but the statistics of the two years are apparently not comparable, and a number of arbitrary allowances would have to be made. To those who do not insist on complete accuracy, however, the evidence of the Staff Returns confirms the impression given by wage statistics. There appears to be little doubt that the inception of the eight-hour day, during State control, necessitated an increase in numbers, which was not, in 1930, offset by greater efficiency, and loss of traffic. It may, therefore, safely be concluded that wages costs increased so violently, largely owing to the increase in weekly wage rates and the reduction in working hours.

In 1929, Professor Clay, speaking of wage-earners in the railway industry, said that they were able to exploit the inelasticity of demand for their services, in order to support wage rates.[1] To repeat this statement here, as a mere fact, is not to praise or blame the policy of the unions, the justification of which is not particularly germane to the present inquiry; but, assuming efficiency to be as great as in 1913,[2] the inability of the companies to earn their pre-war revenues would appear to lie in the abnormal increase in wages costs which this policy brought about. Gross revenue, despite general trade conditions, was greater than before the war, and, according to the companies, could be increased only through influences beyond their control.[3] Gross expenditure could only be decreased, apart from changes

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[1] *Economic Journal*, Vol. XXXIX, No. 55, p. 323 et seq.

[2] The Railway Rates Tribunal believed them to be efficient.

[3] When they were given the opportunity of applying for revision of rates and fares, to make up the deficiency of net revenue in 1930, they refused to recommend an increase or a decrease, on the ground that, owing to motor competition and trade depression, the position could not be improved (*Proceedings of the Railway Rates Tribunal*, 1931, No. 11, Judgment date May 27, 1931). It is thus possible, though scarcely certain, that charges were at the maximum level, so that increases of gross revenue could only come from an increase in demand. See later pp. 102 to 103, however.

their standards of living. It is popular doctrine, judged by what standards may be, that railway wages were unduly low before the war,[1] and that any real increases maintained during post-war years were really bringing them up to what may be regarded as a reasonable level. The point at issue, however, is not really whether it was desirable that railway wages *should* have increased, even at the expense of industry in general, but whether they actually *did* so, and on this there is evidence enough to give an affirmative answer. Perhaps the public really owed the increases (I believe they did owe *some* improvement) judged by wage-regulating standards, but at any rate they were compelled to provide them.

Post-war experience in the railway industry is, indeed, rather indicative of a difficulty in connection with the operation of the Railways Act, 1921. The detailed provisions of the Act in so far as they concern industrial fluctuations will be considered later, but for the moment it may be recalled that the Railway Rates Tribunal is called upon to establish such a level of rates as will, "with efficient and economical working," yield a certain net revenue. It is clear that this revenue may be imperilled owing to excessively high wages, especially when such a situation arises as that of 1928–1930. Failing the ability of the traders to bear higher rates, the only way in which the difficulty can be overcome is either by attacking wages or by asserting that the companies are not being efficiently and economically managed.[2] Yet it is just here that the machinery of this generally unhappy Act meets difficulties.

The Tribunal has no power over wages at all. There are two wage-regulating bodies, but they are not co-ordinated with the Tribunal in a legally binding way, and in any case have no compulsory powers. In other words, there are three chief parties linked up in the standard revenue provisions——the railway companies,

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[1] This idea is very common, but definite proof is hard to produce. Vide Cole and Page Arnott: *Trade Unionism on the Railways*, p. 24.

[2] Assuming, of course, that it is intended to work the Act rigidly.

railway labour, and the trading public. The Railway Rates Tribunal has power to bind only two of them in fixing rates and fares. A scheme which imposes control on only two out of three variables is not mechanically water-tight, because the free agent can, to some extent, prevent the desired result from being attained. This is not, however, to argue without sophistication for the compulsory fixing of wages by the Tribunal, but merely to point out that perfect control implies control of all the factors concerned in bringing about a given result. Elementary mathematics proves so much. In actual fact, of course, it is inconceivable that a legal obstacle should prevent the parties from making satisfactory arrange-ments to overcome any difficulties which may arise on this score. From the point of view of administrative machinery, nevertheless, the difficulty is that, if the Tribunal says to the companies that it believes they are efficiently managed (in a physical sense) and that the traders cannot bear higher rates, so that a shortage of net revenue can only be made up by wage reductions, it has no control over the situation beyond mere pious recommendation.

_ The railway unions can put forward the view that the men are merely selling their labour like any other com-modity, and that the companies' profits depend, not on wages costs alone, but also on the costs of materials, services, etc. These "other" costs are beyond the control of the companies and the Tribunal, in so far as they are controlled by purely competitive conditions, yet they are just as much a factor affecting the profit level as are wages. Therefore, to control wages is to put an unjustifiable burden on one type of commodity being sold to the railways compared with other commodities. As a general argument this defence hardly seems quite fair, because railway labour is practically a monopolised commodity, and its price is indeterminate within fairly wide practical limits, even apart from the theoretical position, and it is just the element of monopoly which is the reason for controlling the railways. The companies are united as a

whole, and the respective unions are solid when it comes to wage negotiations. The result is that something akin to the theoretical position of bi-lateral monopoly exists in the short period. If the railway companies are asked too much for their sleepers by an individual seller, they can buy from another source; but if the National Union of Railwaymen is solid for a given price for labour, it is absolutely impossible to bring in non-union men with sufficient training to carry on the work. This difficulty of monopolisation is, indeed, spreading from labour to other commodities, and the control of coal prices through the marketing schemes seems to create an additional field in which it is manifest. Sir Josiah Stamp, during discussion of these schemes, expressed some concern in regard to their effect on railway net revenues. Indeed, regulation and Government control of industry have so many ramifications at the present time that co-ordination of the various schemes is a matter of some delicacy. The action of one scheme frequently involves effects on others which are hard to trace. Whatever may be said in comparing labour to other commodities, however, is not sound on general grounds. If fear of monopoly exploitation is a reason for controlling railway profits, post-war experience would suggest that the danger also lies in the possibility of exploitation by railway labour.

Efficiency and economy are very difficult conditions to define. A railway may have a very high physical efficiency, in that its output per man-hour, etc., is high, but if wages are high, they may more than offset the output factor. What the words will be assumed to mean in regard to the provisions of the Act one cannot say, but clearly the price factor will have to be considered as well as physical output. Doubt may be expressed, however, as to whether the Tribunal is so constituted as to be capable of giving a highly technical judgment in regard to efficiency. This problem has arisen in the United States, under similar terms contained in the Transportation Act of 1920, and the Interstate Commerce

Commission has confessed that "to go into the question of efficiency of management in a *thoroughly effective way* would necessitate an organisation of experts especially qualified to investigate the numerous and complex phases of railroad management, such as shop methods, locomotive performances, road and terminal operation, maintenance of way and structures, purchasing and many others."[1] Even this relatively well-equipped body, which can afford to employ a large number of costly engineers for the purpose of making a physical valuation of the railroads, was not convinced that it was called upon to engage in the study of operating efficiency on so elaborate a plan, and a body of three British Commissioners, already burdened with other work, however well supplied with outside assessors, cannot presume to do better. Clearly, there are three ways in which efficiency can be tested. The first is by statistical comparison of one year's performance with another. Efficiency indices of this kind, however, do not indicate what *could be* so much as what *has been* done, and, in any case, tend to show cyclical variations which are not indicative of varying efficiency, but are inevitable owing to the character of the indices themselves.[2] The second is by comparing one railway system with another. This is obviously a highly dangerous procedure in most cases, owing to differences in circumstances which cannot be measured statistically and to the close knowledge of local conditions which it implies. Neither of the first two "relative" methods gives any idea of "absolute" efficiency, because, even though improvements can be shown, it does not follow that they could not be greater. The only real test is by means of continuous field investigation. Dare we say that the Railway Rates Tribunal has either the technical knowledge or finance at its command to do this? Like the present writer, most students will be impressed with the extraordinary improvements which have taken

[1] *Annual Report* for 1922, p. 25.
[2] Ven Way Woo: *Efficiency in Railroad Management: A Study in the Requirements of Section 15a of the Transportation Act, 1920* (Univ. Pennsylvania, 1926).

place in the accepted operating indices of recent years, but the non-technician, or a member of a tribunal, must find it extremely difficult to meet specific criticisms in regard to actual conditions in given yards, stations, locomotive depots, etc., which are often brought forward by labour representatives in connection with their claim that high wages might be maintained if only the railways were managed as efficiently as they "might" be. The "amateur manager" among the rank and file of railway men can be an intolerable and dangerous bore to those more intimately acquainted with managerial problems and bearing more responsibility in connection with the drafting of policy, it is true, but it would be rash to ignore entirely the claims sometimes made by leaders possessed of well-balanced judgment. Only the most elaborate studies at prohibitive cost could show whether all of the yards of a given system were best suited for their task, having regard to the probable cost of reconstruction. The outsider can never really know whether, in fact, given operations are overstaffed in undertakings so large as those of the four big railways, and no regulatory body would care to take away from the company executives their purely managerial function of deciding if, when, and how actual operations should be carried out.[1] It is therefore difficult for the Railway Rates Tribunal to deal with the problem of wages, especially when we recall (with Mr. Rowe) that high wages are, in themselves, a whip to sting the companies to greater effort. When, as in recent years, however, marked improvement has been shown at the same time that railway wages have been out of line with wages in general, the case for modification is clear.

The general level of post-war railway prosperity,

[1] Woo, op. cit., quotes the expressed opinion of one United States Commissioner as showing the danger of meticulous interference in impairing managerial efficiency. The companies would be likely to say, when criticised: "We did what we thought best before, and were reprimanded. Now we will play safe. . . . If we fail, only the public will suffer." Matters are not likely to go so far, of course, but it is an old maxim of public administration that "authority and responsibility should be co-extensive."

then, though indicative of exceptional circumstances, conforms to type in some respects, and rather hints at certain fundamental weaknesses in the regulation set up by the Railways Act, assuming, of course, that the words of the Act are to be taken to mean what they say. If compromise is made in regard to policy, and the level of charges, railway wages, and railway net revenue are all allowed to fluctuate, in modification of a strict interpretation of the Act's provisions, the difficulties will not be so manifest. But that would be a confession that the Act, as it stands, is not capable of operation. Further consideration of the problem is, however, deferred to Chapter V.

THE "BIG FOUR"

(1) 1884–1912

So far we have taken a highly generalised view of the railway industry as a whole, but it seems *prima facie* unlikely that business fluctuations will have affected all parts of the system equally. Indeed, on general grounds, we should expect those areas serving highly fluctuating trade, such as engineering, shipbuilding, coal-mining, etc., to be more subject to fluctuations of profitability than those serving relatively stable trades such as agriculture and foodstuffs. Tentative exploration in the detail of the *Annual Railway Returns* shows that this has been the fact. Railways serving the Barrow, Cumberland, and Carnforth ironworks, those covering South Wales, and those in the North-East were particularly subject to fluctuations. The history of these old pre-war companies may have merely an academic interest, but it is of some practical importance to the managements of the "Big Four" which cover the country at the present time. It would possibly repay them to make analyses of their different areas (comprised within the old constituent companies which formed them) in order to discover their respective stability. Certain parts will be discovered to have been commonly more subject to fluctuations than others. In the present depression, which has lasted in various degrees ever since 1921, these highly fluctuating companies have, to some extent, been carried by their more fortunate partners, and without the added stability which was derived from pooling of earnings it is not unlikely that they would have reached the point of legal bankruptcy.

Apart from the interest in the past records of the constituent companies comprised within the areas of the "Big Four," there is even more in a study of the relative degree of liability to fluctuation of each of the

big companies themselves. The Government has created them by means of compulsory legislation, and has therefore a certain amount of responsibility for any results which may accrue from the grouping adopted in the Railways Act. In so far as the groups are of varying stability, the shareholders and the general public will be affected in different ways, though the effect on the former is partly compensatory with that on the latter. If rates and fares are effectively raised in order to protect the shareholder, the general public will suffer. If they are kept stable, the burden will be on the shareholder. If it becomes necessary to alter the rates and fares of the four companies in different degrees (on account of the difference in susceptibility to fluctuation), the public will suffer in varying degree according to the railway company on which they depend for transport. If rates and fares are kept stable in face of differences in fluctuations of revenue, the shareholders will be differently affected according as their investments are in one company or another. In these considerations lies the importance of studying the effect of trade fluctuations on each of the "Big Four" separately.

The facts, however, are rather obscure. In the first place, the "Big Four" only date their legal entity from 1923. The Railways Act, 1921, made provision for the grouping, but the actual work of carrying out the operation was entrusted to an Amalgamation Tribunal, which completed its task in the summer of 1923, when the Southern, the London, Midland and Scottish, the London and North Eastern, and the Great Western first took shape. As a result, only post-war experience is available in convenient form. In the second, as we have seen, post-war conditions have been abnormal in a high degree. Nevertheless, many students have assumed that the relative reactions of each of the "Big Four" to trade depression in recent years is a complete indication of probable future tendencies. It is possible that, just as the general post-war depression proved abnormal, so the reactions of the individual companies were abnormal; and, to

clarify the facts, the procedure has been adopted of examining the pre- and post-war fluctuations of the "Big Four" separately.

In order to investigate the former, the financial history of each of the companies has been traced back for the period 1884 to 1912, which covers three complete cycles. This has been done by taking the "constituent" (not the "absorbed," except in so far as they were worked by the "constituent") companies in each "amalgamated" group and working back along their genealogical tree. Altogether, the history of roughly 240 companies (including "worked" companies) has been traced back over the whole period, and only a few minor companies have been omitted from the calculation, which loses nothing thereby.

It will be observed that the resultant figures are not ideal. The period only covers three complete cycles, and omits the fourth, which has been included in the general analysis. Since the financial relationship of railway net revenues to trade conditions was different in the early years from what it was in the later years, the omission of the first cycle is perhaps important. The reason why it has not been included is largely that the data became less and less reliable as the investigation pushed backwards. The exact composition of the various companies could not be so easily traced. Even the old Great Western, which might have appeared the easiest of all to analyse, owing to the continuity of its history, was split up into between fifty and sixty separate entities by the time 1884 was reached, and it became increasingly difficult to avoid duplication of the statistics. Nevertheless, further research would probably enable some degree of comparability to be secured even back to 1878. Secondly, there is a random fall in the Great Western statistics for 1898, owing to the Welsh coal strike of that year.[1] So dependent is this company on South Wales, that it is not surprising to find net revenues seriously affected by the event. A dotted line is used in the chart to bridge over the gap. The year

[1] *Bankers' Magazine*, 1907, pp. 3 et seq.

CHART V
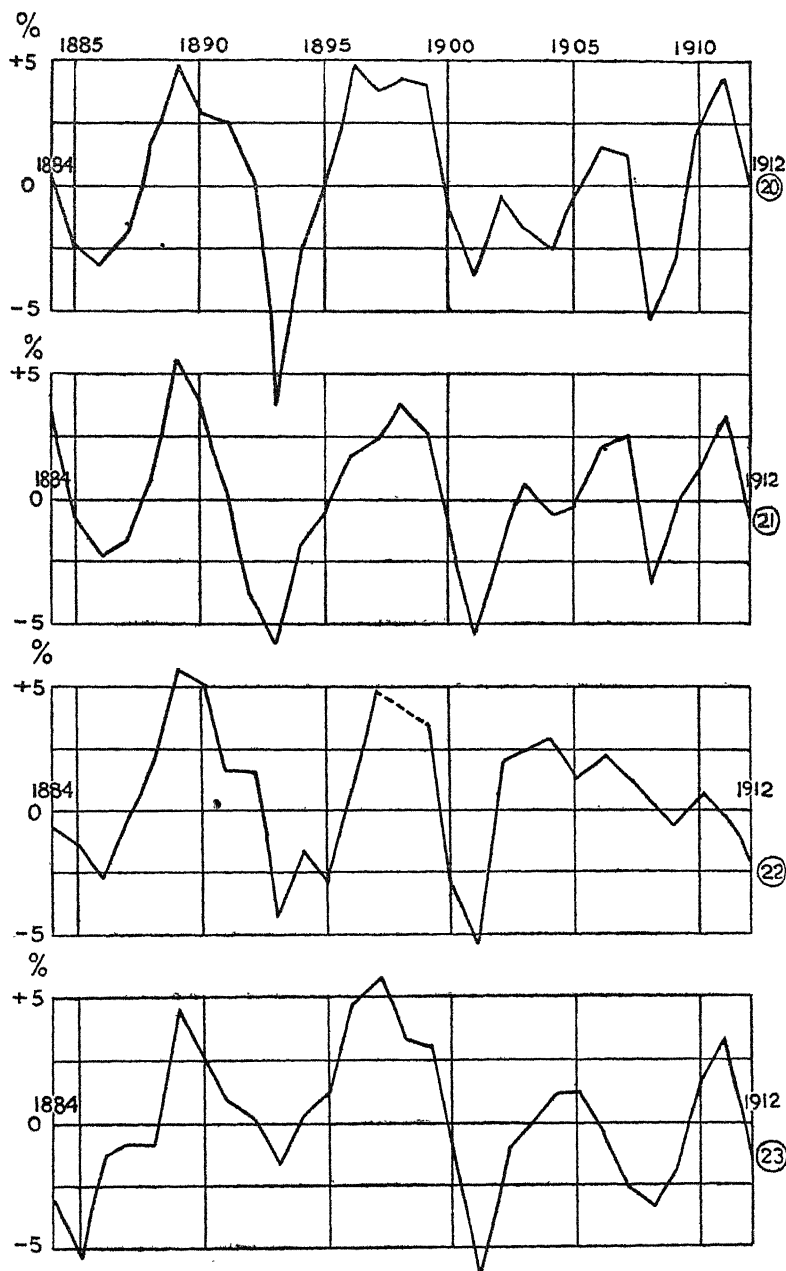
RESIDUAL CYCLES

1912 was also abnormal on account of coal stoppages, but the effect in this case was more general, and was not confined to one particular road. In addition, 1912 is not really necessary for the study of the cycles to the same extent that 1898 can be said to be. Allowance being made for these things, however, the results are not substantially vitiated by them.

Table 12 gives the net revenue statistics relevant, among others to the London, Midland and Scottish

TABLE 12

Great Britain: Percentage Cyclical Residual of the Net Revenues of the "Big Four," 1884–1912

Year	L.M.S.R.	L.N.E.R.	G.W.R.	S.R.
1884	+ 0·23	+ 3·65	— 0·65	— 3·34
1885	— 2·29	— 0·92	— 1·29	— 5·41
1886	— 3·16	— 2·16	— 2·56	— 1·39
1887	— 1·94	— 1·67	— 0·42	— 0·92
1888	+ 1·69	+ 0·55	+ 1·90	— 0·91
1889	+ 4·66	+ 5·50	+ 5·65	+ 4·71
1890	+ 2·95	+ 3·50	+ 5·32	+ 2·65
1891	+ 2·42	+ 0·21	+ 1·64	+ 0·65
1892	+ 0·35	— 4·01	+ 1·63	+ 0·22
1893	— 8·70	— 5·97	— 4·22	— 1·50
1894	— 2·48	— 1·89	— 1·59	+ 0·42
1895	— 0·20	— 0·68	— 2·75	+ 1·25
1896	+ 4·79	+ 1·74	+ 0·97	+ 4·75
1897	+ 3·87	+ 2·19	+ 4·78	+ 5·71
1898	+ 4·29	+ 3·84	— 11·68	+ 3·43
1899	+ 4·12	+ 2·68	+ 3·53	+ 3·20
1900	— 1·10	—1·55	— 3·10	— 1·78
1901	— 3·68	— 5·48	— 5·39	— 6·07
1902	— 0·63	— 2·04	+ 2·12	— 1·16
1903	— 1·89	+ 0·35	+ 2·43	—
1904	— 2·55	— 0·60	+ 2·90	+ 1·14
1905	— 0·31	— 0·17	+ 1·34	+ 1·13
1906	+ 1·65	+ 2·18	+ 2·14	— 0·56
1907	+ 1·33	+ 2·48	+ 1·45	— 2·57
1908	— 5·33	— 3·52	+ 0·47	— 3·46
1909	— 2·79	— 0·40	— 0·62	— 1·81
1910	+ 2·24	+ 1·43	+ 0·61	+ 1·79
1911	+ 4·49	+ 3·47	— 0·30	+ 3·36
1912	— 0·29	— 1·40	— 2·34	— 1·58

Source: *Annual Railway Returns.*

Company. From the crude data trend has been removed with a straight line:—

$$y = 1513 + 15 \cdot 5x \quad (\pounds 0000)$$

and residuals, charted in Curve 20, have been put into the form of percentages.

The three cycles which existed over the period 1884 to 1912 are particularly well reproduced in the curve, though, as in the case of railways in general, there is much more irregularity than might have been expected. If their amplitude is measured by reference to the position of maxima and minima, the figures of the turning-points, in consecutive order, are $- 3 \cdot 16$, $+ 4 \cdot 66$, $- 8 \cdot 70$, $+ 4 \cdot 79$, $- 3 \cdot 68$, $+ 1 \cdot 65$, and $- 5 \cdot 33$ per cent. of trend respectively. As might have been expected, the degree of fluctuation declined as time went on, so that there was no uniformity of amplitude. To iron out the differences in each cycle by averaging the magnitude of the three is perhaps dangerous, because the really significant features are the differences rather than the similarities; but it is valuable to know that the average of the four minima was $8 \cdot 92$ points below the average of the three maxima. This figure may later be compared with those of the other companies for general purposes.

Corresponding figures for the next largest member of the "Big Four," i.e. the London and North Eastern Company, are given in the same table, the analyses being exactly the same as those for the London, Midland, and Scottish Company. Trend has been removed with the formula:—

$$y = 1066 + 15 \cdot 5x \quad (\pounds 0000)$$

and the residuals are charted in Curve 21.

Even on a hasty glance at the cycles it can be seen that they are more symmetrical than those of the London, Midland, and Scottish, though there is apparently general similarity between them. Indeed, the years of maxima and minima for the two biggest companies are really more alike than the mere enumeration of turning-points

would itself seem to indicate. The maximum of the second London and North Eastern cycle occurs in 1898, just two years after that of the London, Midland, and Scottish, but there is considerable roughness in regard to the date of the latter's maximum on account of the flat period between 1896 and 1899. With another type of trend-removing formula it is quite possible that the result would have been otherwise, and, in any case, there is a "shadow" maximum in 1898 which may be said to correspond to the actual maximum of the London and North Eastern. Similar arguments would apply in the case of the only other divergence, i.e. the maximum for the third cycle, in which the London, Midland, and Scottish apparently antedates the London and North Eastern by one year. Measuring amplitude in the manner usually adopted, the percentages, in time order, are as follows: — 2·16, + 5·50, — 5·97, + 3·84, — 5·48, + 2·48, and — 3·52 per cent. On the average, the minima were thus 8·22 points below the maxima. Therefore, it seems probable that, with the limitations mentioned, the London, Midland, and Scottish was subject to relatively greater fluctuations than the London and North Eastern. The relative difference, however, is really so small (0·70 per cent.) that it probably is unwise to attach too much significance to it. In different cycles different relative degrees of fluctuation existed, and to expect one company always to exceed the other would be an unjustifiable inference from the figures.

The Great Western comes next under consideration. The trend eliminating curve is of the parabolic form in this case, however, because a straight line seemed to yield a poor sight fit. For this reason any conclusions in respect of the cyclical timing and amplitude are perhaps subject to more limitations than those previously obtained from the other companies. The formula is:—

$$y = 531 + 7·88x + 0·221x^2 \quad (£0000)$$

and the residuals curve is number 22.

The cycles are even more irregular than those already

secured for the London, Midland, and Scottish and the
London and North Eastern. Indeed, of the three which
might have been anticipated, only the first gives adequate
symmetry. The second is badly distorted by the coal
strike of 1898, which seems to have occurred just at a
time when a position of maximum might have been
expected. The London, Midland, and Scottish dated its
maximum in 1896; the London and North Eastern in
1898; when can the maximum for the Great Western
be assumed to have occurred? No safe answer can be
given. The third cycle is almost impossible to discover,
unless its boundary minima can be put at 1901 and 1909,
with a maximum in 1904. To suggest this, however,
is to do violence to the normal meaning of the word
"cycle." The Great Western, then, is particularly difficult
to compare with the others, and divergences of time-
incidence cannot be given that importance which we
might care to give them. To compare amplitudes, when
the cycles themselves are highly obscure, is not of great
value, but for what they are worth the figures are as
follows: — 2·56, + 5·65, — 4·22, + 4·78, — 5·39,
+ 2·90, and — 0·62 per cent. The average of the chosen
minima was 7·64 points below the maxima, less than
either the London, Midland, and Scottish or the London
and North Eastern. If it were not in conformity with
prima facie conclusions the figure might be rejected
off-hand, but it is probably true that the Great Western
was more stable than the other two companies.

Finally, there is the Southern Railway, so obviously
dependent on passenger traffic and the non-industrial
south that fluctuations should, at first sight, appear small.
The actual statistics, however, are less assuring. From the
crude data collected in Table 12, secular trend has been
eliminated with the equation :—

$$y = 495 + 5 \cdot 4x \quad (£0000)$$

and the cyclical residuals have been charted in Curve 23.

The cyclical content in Southern Railway net revenue
is the most symmetrical of all. Even the typical irregu-

larities of the third complete wave find no place in the smoothness of this company's data. On the other hand, the position of the maxima and minima is not quite the same as for the other groups. The first minimum is different from all others, being one year in advance. The maximum for the second cycle, too, is midway between those of the London, Midland, and Scottish and the London and North Eastern curves, though this is not really significant. That the third cycle is different from those of the other companies, except in regard to its starting-point, is also of more interest than practical importance, because of the roughness of the general movement. On the whole, a safe conclusion would point to the similarities of Southern Railway and other net revenue cycles rather than their divergences. Once this is accepted, the amplitude of the cycles appears quite small judged by the standards of the two big companies. In chronological order, the percentage divergences from secular trend were: $- 5 \cdot 41, + 4 \cdot 71, - 1 \cdot 50, + 5 \cdot 71,$ $- 6 \cdot 07, + 1 \cdot 14,$ and $- 3 \cdot 46$. These, when averaged out, show a difference of $7 \cdot 96$ points as between good and bad times. Less than either the London, Midland, and Scottish or the London and North Eastern, the figure is, nevertheless, slightly higher than that of the Great Western.

If the present analysis proves anything with regard to the years which it covers, it is that there were no really great differences in the relative degrees of fluctuation in the net revenues of the "Big Four." It is true that the order of magnitude would put the London, Midland, and Scottish highest, with the London and North Eastern, the Southern, and the Great Western following in sequence. The difference between the highest and the lowest on the list, however, is only a matter of $1 \cdot 28$ per cent. of trend. The absolute amount of the divergences from secular trend, on the other hand, is clearly biggest for the biggest companies, as is only natural.

These results are perhaps surprising, because they seem to modify *prima facie* conclusions. The general

analysis, for example, has proved that passenger traffic and revenues have normally been more stable than freight traffic and revenues. Reference to Table 14 shows that the proportion of their gross revenue which each of the "Big Four" derives from passenger sources at the present time varies considerably. The Southern figures highest with 74 per cent.; the Great Western next with 43 per cent.; the London, Midland, and Scottish next with 40 per cent.; and the London and North Eastern last with 36 per cent. On these grounds alone, static theory would seem to suggest that the order of fluctuation should be the same, but this was not so during the period 1884 to 1912. The two last companies, to be sure, can be said to have fluctuated more than the first and second, but beyond this the order is not the same for degree of fluctuation and dependence on passenger transport.

Closer consideration, however, will suggest that the static theory cannot be assumed to have worked out with perfect accuracy over these years, because price movements have taken place. It would, therefore, be surprising to find an accurate reflection of dependence on passenger traffic in the net revenue variation. Furthermore, the Great Western net revenue figures are not sufficiently well produced for great reliance to be put on them, and it would be unfair to relate their average fluctuation to the order in Table 14, which is more rigidly constructed. Within these limits, the fact still remains that the two northern companies, which are so intimately dependent on industrial conditions, showed at least some degree of fluctuation greater than the two southern companies.

(2) 1913–1930

If, during pre-war years, examination of the cyclical fluctuations of net revenue about the computed ordinates of secular trend does not indicate any very *marked* difference of degree as between the "Big Four," though

there is evidence that the two industrial were somewhat more unstable than the two southern systems, in the post-war period there appears to be more obvious divergency. Comparison can be made between the years 1913 and 1930 through the medium of the standard revenue provisions of the Railways Act, 1921. The standard (with allowance for capital additions) represents, to some extent, the "norm" against which excesses or shortages may be gauged.

Table 13 shows that the allowable figure for the

TABLE 13

Great Britain: Comparison of Actual and Standard Revenues (Plus Allowance for Additional Capital) in 1930

1 Company	2 Standard Plus Allowance	3 Actual Net Revenue	4 Deficiency	5
	£	£	£	Per Cent.
L.M.S.R.	20,574,903	13,426,290	7,148,613	34·7
L.N.E.R.	15,017,556	11,168,749	3,848,807	25·6
G.W.R.	8,369,499	6,987,146	1,382,353	16·5
S.R.	6,878,480	6,133,927	744,553	10·8
Total	50,840,438	37,716,112	13,124,326	25·8

Source: *Proceedings of the Railway Rates Tribunal,* Year 1931, No. 11, pp. 127 and 129.

railways as a whole in 1930 was £50·8 M, but that, in fact, only £37·7 M was earned. The average deficiency of 25·8 per cent., however, concealed considerable differences in respect of the individual companies. The London, Midland, and Scottish suffered most with 34·7 per cent. deficiency; the London and North Eastern, the Great Western, and the Southern following with figures of 25·6, 16·5, and 10·8 per cent. respectively. In other post-war years the order of deficiency has not been exactly the same as that in 1930, but, as a rule, the facts reinforce the results obtained for the period 1884–1912. The London, Midland, and Scottish may have changed places with the London and North

Eastern on occasion, and the Great Western with the Southern, whilst the divergency between the two former and the two latter may have increased or decreased. On the whole, however, the industrial systems have been

TABLE 14

Great Britain: Proportion of "Gross Railway" Revenue derived from Passenger and Goods Train Traffic during 1930 on Each of the Companies constituted under the Railways Act, 1921.

1		2 3 Passenger Trains		4 5 Goods Trains		6 7 Other Sources	
Company		£000	Per Cent. of Total	£000	Per Cent. of Total	£000	Per Cent. of Total
L.N.E.R.	..	18,368	35·06	33,584	64·10	438	0·84
L.M.S.R.	..	27,217	39·88	40,369	59·16	655	0·96
G.W.R.	..	12,350	41·74	16,980	57·38	260	0·88
S.R. ..	..	16,564	73·96	5,576	24·90	257	1·14

Source: *Annual Railway Returns*, 1930.

subject to greater fluctuations, despite the abnormality of the great post-war depression. This generalisation is not entirely lacking in practical significance, though, so far as I am aware, the facts have never been tested statistically and put into perspective as in the present chapter.

THE RAILWAYS ACT, 1921

(I)

CYCLICAL fluctuations of profits are so common a feature of industry, and have an appearance of such inevitability, that their peculiarity for the railways has naturally been neglected. Most students of business fluctuations agree that, with the present organisation of society, they are likely to continue in general industry, and with them one can expect a continuance of the same tendency in railway phenomena, though exactly what form they will take cannot definitely be forecasted.

At one time it might have been said that short-period oscillations of prosperity were the burden of the shareholder alone, and that the trading public was only concerned in dividends over the long period, in so far as they had to be sufficient to attract adequate supplies of capital into the industry to provide an expanding service. Conditions now, in theory at least, are different. Conforming largely to practice evolved historically in the United States from English common law roots, new methods of control have been imposed in such a way as to attempt to reverse the old order and put the burden of all profit fluctuations on to the trader. In sections 58 and 59 of the Railways Act, 1921, there have been established principles which, in effect, seem to approach the problem of cyclical (indeed, of all) profit fluctuations, not by removing their fundamental causes, but by trying to take the burden from the railways and to pass it on to other industries. In this there is a change of policy, the effects of which are of importance and general significance, since they are likely to follow the extension of the same regulatory principles to other public utilities with the same economic characteristics, such as gas, electricity, or tramway undertakings.

The present chapter is not concerned so much with

what has happened in the past as with the theoretical implications of the system in so far as they are illustrated by past conditions. The British railways have not yet earned their standard revenues, and the effects of the complete normal business cycle on the standard have not yet been tested in actual practice. Some day, nevertheless, the problems are likely to arise, and the Railway Rates Tribunal will have to decide exactly what its policy is going to be. Only by prior investigation of the results which are theoretically inevitable can a reasonable approach to such a decision be made. Quite conceivably the Railways Act itself may be modified, or the railway system may be nationalised. To know the tendencies in present-day legislation, however, is to be able to estimate its value in terms of probability rather than facts.

The Act established a Railway Rates Tribunal, which took from the companies, as from January 1, 1928, the duty of fixing rates and fares. With the minute details of procedure we are not immediately concerned, but sections 58 and 59 provided that the charges fixed in the first instance for each company should be such as would, together with other sources of revenue, in the opinion of the Tribunal, so far as practicable, yield, with efficient and economical working and management, an annual net revenue (called the "standard revenue") equivalent to that of 1913, together with certain other semi-fixed and non-recurrent amounts in respect of past capital expenditure and amalgamation economies. When fixing charges, of course, arrangements were to be made for ancillary undertakings, the charges of which are not subject to the jurisdiction of the Tribunal, to be adequately remunerative. After the first year of operation under the scheme, the Tribunal was to review the rates and fares, but after the second annual review, the Minister of Transport could direct that a review be not held in respect of any or all of the companies, provided that there were no request from the company or any representative body of traders. The review is to be made on the ex-

perience of the operation of the charges for the period during which the standard charges have been in operation, or, if that period is more than three years, then on the experience of those charges during the preceding three years.

Should it appear that the company has earned revenue substantially in excess of the standard, together with such allowance as appears necessary to remunerate adequately any additional capital, and that the excess is likely to continue, the Tribunal is bound to modify all or any of the standard charges so as to reduce the net revenue of the company in subsequent years by an extent equivalent to 80 per cent. of such excess. The remaining 20 per cent. is added to the "standard" (to give what is called the "increased standard") for the purpose of subsequent reviews, but if at any time afterwards rates and fares are increased to make up a deficiency of "standard" revenue, the "increased standard" cannot be substituted for the "standard" until an excess above the standard, together with allowance for subsequent additional capital, is again found.

Correspondingly, should the Tribunal, on review, find that the net revenue, or the annual average net revenue, obtained by the company during the period on the experience of which the review is based is less than the "standard" revenue, with adequate allowances for additional capital raised since the inception of the "standard charges," and that the deficiency is not due to lack of efficiency or economy in the management, then it is obliged, unless in its opinion owing to change of circumstances the deficiency is not likely to continue, to make such modifications in all or any of the standard charges and such a corresponding general modification of the exceptional charges of the company as it may think necessary to enable the company to earn the standard revenue, plus subsequent capital earnings allowances.

Finally, to conclude this précis of the regulatory principles of the Act, when making alterations in respect

of one company on account of an excess, the Tribunal must avoid modifications likely to prejudice the financial position of any other company, and all modifications are to date from July 1st in the year following that reviewed.

In a broad way these provisions point to two alternatives. Either the Tribunal will always adjust rates to keep stability of net revenue, or it will keep rates stable and allow net revenue to fluctuate as in the past. If a half-way policy is pursued, and both rates and profits are allowed to fluctuate, it is difficult to see how this is justified in the words of the Act, though we have in Britain a habit of making working compromises in defiance of exact legal interpretation. It is to be noted, however, that even though the railway companies or the traders do not recommend rate and fare alterations in order to secure their own interests, this does not absolve the Tribunal from acting quite independently. In the review of conditions in 1928, the first year of operation under the scheme, there was a deficiency of standard revenue, but the companies were convinced that any general alteration of rates and fares in an upward direction would not improve their position. They therefore refused to appeal for revisions. The Tribunal itself, however, pointed out that the duty still lay upon it to review the operation of the standard charges and make independent changes, though it was convinced that the suggestions of the companies represented the wisest policy at the time.[1] No alterations were made, it is true, but the Tribunal clearly recognised the mandatory nature of its duty.

At first glance it would appear, indeed, that there is no alternative whatever to adjusting charges and keeping profits constant. But closer observation will prove that a modicum of discretion is given to the Tribunal not to adjust if, in its opinion, excess or deficiency is not likely to continue. Exactly what is meant by these words one cannot say. To cast aside the possibility that they may

[1] *Proceedings of the Railway Rates Tribunal*, 1929, No. 16, Judgment dated June 4, 1929.

serve as a means for keeping charges at a stable level,[1] however, is to close the door to a solution to some of the difficulties which follow from adjustments. Whether or not there is a loophole which will allow of the second alternative need not prevent comparison from being made on their merits, even though it be decided later that legal interpretation only permits of one course of action. The effects of keeping rates stable, as before the war, are to cause fluctuations of the return to capital and possibly labour. These effects have already been experienced and analysed between 1878 and 1912. On the other hand, the implications of stabilising revenues at the expense of rates and fares have never been examined or experienced. These are the possibilities which it is intended to investigate in this chapter. To do so needs no great expenditure of words, since the broad ideas can be stated quite concisely.

(2)

There are many obvious criticisms of the Railways Act's provisions as regards both principle and detail. Most general of all is the allegation that adjustment of rates and fares to yield stability of money net revenue causes undesirable disturbances to trade. General alterations of charges are phenomena of which there was little experience before the war, though their steadiness, combined with variations in the general price level, undoubtedly caused changes in their "real" level. In 1914 there was an Act allowing an increase in order to meet the rising costs of operation due to the new wage awards, but this was an isolated case. Since the war, however, the companies have, at various times, made alterations in the general level without any knowledge of probable effects, based on pre-war experience, and a sense of dissatisfaction has been aroused. The Railway Rates

[1] Rates have not been raised at the last three revisions because it has been thought that this policy would not improve the position for the railways. But should it appear that revision would be possible, then the policy discussed in this section would be debated. Should rates be raised, if it were possible to raise them?

Tribunal has borne the burden of most of the complaints, but various Parliamentary committees (such as the Balfour Committee on Industry and Trade) have been requested to examine them.

The burden of most of the charges has been that the general level of rates and fares was too high relative to the average rise in commodity prices, and that means should be devised to lower it. This is really a criticism which cannot be levied at the railway companies as such, for, assuming them to be efficient, there will still be variations in prosperity which must be made up by rate revisions, and, if this is granted, the complaint must be taken to Parliament for passing the Railways Act, and not to the companies for trying to make the Act work. The main problem for present purposes is whether adjustments of this kind are desirable. Rates and fares must cover costs in the long run, if the railways are to remain in private hands, but is it desirable that they should cover the costs of every particular year? Would it not be better that the losses of a period of depression for the companies should be allowed to stand, being made up by the extra profits of a prosperous period? In short, would it not be better to have stability of charges rather than short-period stability of profits, assuming that the general level of the latter will, over the average of good and bad times, meet costs in an adequate measure? It is argued that business relations thrive on stability. Future contracts cannot always be safely made without it, and, since the smooth-working of industry depends on the anticipation of consumers' demands, some guarantee of the movement of future costs of production must be available. Relationships are established on the faith of security as to railroad rates, and any disturbances of those relationships brought about by revisions are undesirable.

There is some point in the criticism, but, lest it assume too great an importance, a sense of proportion ought to be brought to bear upon it. From what has already been said as to the magnitude of past fluctuations, it is clear that there has been no uniformity in their extent. More-

over, owing to changes in post-war conditions, we cannot forecast with any degree of assurance what is likely to happen in the future. Even if we suppose, however, that the past affords a serviceable guide, the possible changes in the general rate level arising out of cyclical trade movements appears quite small. Prior to the war there was an average increase of less than 9 per cent. in the return on paid-up capital during booms compared with depressions. Taking a deficiency of 25 per cent. as a reasonable outside figure—which is clearly not warranted by the facts[1]—it cannot be assumed that this necessarily implies a variation of rates and fares by 25 per cent. At the present time 25 per cent. of standard revenue amounts to approximately £12·5 M. This is only about 6·1 per cent. of total gross revenue from railway operating, so that, assuming demand to be everywhere inelastic and a uniform percentage alteration to be effectively applied, the difference in rates as between boom and depression, allowance being made for secular trend, could only be about 6·1 per cent. These figures are not advanced for their accuracy, and no reliance should be put upon them, but they do suggest that fluctuations of net revenue are no indication whatever of the degree of adjustment required in rates and fares.

A further point in qualification of the criticism of rate and fare adjustments is that, even supposing the percentage increases and decreases to be in themselves relatively large, the degree to which they would affect the general level of trade is still problematical. The total effect, of course, would depend on the influence which the revisions would have on the final price to the consumer, and this is not only a question of the proportionate variation of rates, but of the proportion which transportation costs bear to total costs of production. Thus, if rates were increased or decreased 100 per cent. and the

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[1] The deficiency in 1930 was partly due to "secular" influences, so that "trade conditions" in the "cyclical" sense cannot be held responsible for the whole. The figure of 25 per cent., however, is perfectly arbitrary, and is offered more in the nature of an example "for the purpose of argument."

costs of transportation were only 5 per cent. of total costs, the effect on price, other things being equal, would merely be an increase of 5 per cent. We know, however, that the possible variations of rates on account of cyclical variations of prosperity are not likely to reach such a high figure as 100 per cent. But what proportion do railway transportation costs bear to total costs? Even here there appears to be doubt, and there is need for some detailed analysis in Great Britain. Messrs. Sherrington and Wood state that "(railway) charges must necessarily enter *very largely* into the selling price of the vast majority of consumption goods,"[1] though they are not investigating this particular problem, and therefore do not produce evidence in support of their statement. On the other hand, in the United States, a land of great distances, though rates are often less than in Great Britain, the Bureau of Railway Economics, after exhaustive investigation into a large number of agricultural commodities,[2] usually came to the conclusion that "freight charges are a *relatively small* part of the price of commodities, even on long-distance hauls, and that commodity price fluctuations caused by market conditions are far greater than any conceivable fluctuations of the cost of transport."[3] What can we say in view of such conflicting evidence?

The Balfour Committee on Industry and Trade, in its publication *Factors in Industrial and Commercial Efficiency*, collected some material relative to the proportions which we need.[4] It is not to be doubted that generalisations based on samples so small as they chose are not as valuable as they might be, but, in default of other British data, they serve to give a useful picture by throwing *prima facie* conclusions into the light of relativity. They show, for

[1] *The Railway Industry of Great Britain*, 1927, p. 3, Rl. Econ. Soc., Memo. 11.
[2] Bureau of Railway Economics: Commodity Prices in Relation to Transportation Costs. Series of Bulletins appearing periodically. Up to the time of writing some thirty-nine have been issued, dealing mostly with cotton, cattle, fruits, wheat, oats, etc.
[3] Bulletin No. 3, on the Cotton Industry, p. 1.
[4] Pp. 496–9 and 517–20.

example, that the typical proportions of rate charges to export value, for coal, pig-iron, iron and steel ingots, and machinery, travelling over their actual average length of haul, in 1925, were, respectively, only 9·22, 4·24, 1·83, and 0·90 per cent. For a haul of 100 miles, which may be taken as quite a generous average, on cotton piece goods the proportion to export prices was but 0·34 per cent., on woollen and worsted tissues 0·24 per cent., and on boots and shoes 0·39 per cent. These are, however, merely figures of transport costs following one process of manufacture, and it is clear that the raw materials themselves have already borne expenses of movement before they are worked up. For example, the aggregate cost of railway carriage comprised in all the processes of making boots, according to the manager of the United Tanners' Association, amounted to 1·6 per cent. of the retail price of the finished article, though the movement of the latter to their market only represented a quarter of this percentage. So, too, the total rail expenses in a typical case produced by the Calico Printers' Association, for working raw cotton through all the stages from import at Liverpool to arrival at Birkenhead as finished cloth for export, were 1·85 per cent. of the price of the cloth. Sir Ralph Wedgwood, before the Rates Advisory Committee in 1920, produced evidence, which the Balfour Committee brought up to 1925, showing that rail charges constituted 29 per cent. of the market price of pig-iron in the Cleveland district, and 16·6 per cent. of the market price of steel ships' plates.

If one may generalise from data so scant as this, the conclusions are two. Most obviously, the average proportion is really quite small relative to the price of the finished article, and minute rate alterations could not affect the latter to any appreciable extent. Equally clear, however, is the fact that the heavy, low-grade materials are those in which rail charges are so important a feature of the selling price. Now these are just the commodities which have a fairly inelastic demand for railway transport.[1]

[1] *Final Report of the Royal Commission on Transport,* 1931, Cmd. 3751, p. 15.

Coal for home consumption could not conceivably move from the inland fields by means of motors to any large degree, though canals might be a potential check on any large rate advances.[1] Nor is it likely that heavy steel work will soon pass largely by road, though there have been considerable developments in ten-wheeled vehicles which are capable of hauling loads as unwieldy as steam locomotives for export. On the other hand, many of the coalfields are located near sea-water, and a railway rate level which was too insistently high would certainly tend to develop these at the expense of the inland fields, because of the competition of coastwise transport. In self-defence, the railway companies serving the inland fields would be obliged to meet the sea rate, and market competition would thus operate to lend elasticity to the general demand for coal transport. At present, however, it seems highly probable that increased rates could be made more effective on the heavier industries than on those producing goods for which motor competition is more effective. In short, the industries which are notoriously subject to violent fluctuations of prosperity are those which apparently seem the best buffer for bearing the effects of fluctuations on the railways. One of the most interesting phenomena of post-war years has been the slow but certain shifting of the burden of overheads from the traffic subject to motor competition to that which is the rigid preserve of the railways. Difficult as this is to substantiate with actual instances, there is no doubt that the motor has compelled reductions of rates on high-valued and small goods without a corresponding alteration on what the practical railwayman calls the "heavies." The only really extra favourable concession which the basic industries obtained, apart from general decreases, up to 1930 was the reduction from the derating scheme under the Local Government Act, 1929.

The evidence from American figures is not always of

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[1] Actually, coal is a less percentage of total traffic on canals than on railroads, though this is rarely realised. Vide *Manchester at Work*, chapter by the writer on "Transport Facilities."

the safest, for the reason that it covers a country with different conditions from those in England. Moreover, the statistics collected by the Bureau of Railway Economics are not general enough and easy of brief reproduction to give a good idea of proportions on industrial products. They are calculated mostly for specific journeys on specific consignments, and in this respect are limited as samples, though their value for certain purposes cannot be gainsaid. The investigation into freight charges and the value of commodities carried out by the United States Interstate Commerce Commission on Class I steam railroads in 1928[1] is perhaps the most reliable general survey carried out in that country. The method adopted was to calculate freight revenue for specific commodity classes, divide it by tonnage originating, and express the residue as a percentage of the wholesale prices ruling as nearly as practicable to the close of the year 1928. Where a commodity class contained two or more articles, an unweighted average or estimated figure of prices had to be used; and if the price referred to point of production, the average freight revenue per ton for the class was added, in order to secure uniformity of values at destination. By using tonnage originating, the value of the analysis was limited, because the average freight payment per ton was often more than that per ton originating. A given consignment might originate several times in its journey from point of production to point of destination, and, though the total freight payment ought strictly to be debited to that one consignment, it would, under this method, be charged against as many consignments as the number of times which the given one originated. Thus it was found that the average freight revenue per ton of wheat was $4·36. This represented one average movement, though more than one such movement was needed to take the average ton to a port or flour mill.[2]

[1] Freight Revenue and Value of Commodities Transported on Class I Steam Railways in the United States, Calendar Year 1928. Statement No. 29111, File No. 18–c–23. Bureau Rly. Econs., Washington, D.C.

[2] Loc. cit., p. 2.

That this limitation makes the figures lower than they otherwise would be is clear.

Briefly, the results seem to confirm those obtained by the Balfour Committee. In regard to carload freight, agricultural products averaged about 10 per cent., though this is a figure computed from items as high as 61 (fresh grapes) and as low as 2·2 (leaf tobacco). Animals and animal products were somewhat more fortunate with an average of 2·93, and a smaller standard deviation about the average. Mines and products of mines, as in Great Britain, figured very high with an average of 21·30, and at least one individual item (bituminous coal) reaching 57·98. Forest products are not altogether different from those of agriculture, and they were therefore not so very different in their typical proportion of 12·96 per cent. Manufactures, a heterogenous mass of commodities which it is almost dangerous to comprise under one term, averaged out 4·54 per cent. Less-than-carload freight of whatever kind had an average of 6·94, which is scarcely less than the average for all freight at 7·08 per cent.

It is not suggested that American figures can be compared *accurately* with those for Great Britain in such a way as to prove that what holds in the one holds in the other, but reasonable conclusions can apparently be drawn from them to buttress the arguments already put forward. As in the few British figures, we find that the average of transportation costs is really quite small relative to total costs of production, even if arbitrary allowances are made for the various stages of production through which commodities pass on their way to final consumption. A percentage of 7·08, even if doubled, is not a serious proportion when the possible changes due to trade fluctuations are considered, though large secular changes, such as those which followed immediately after the war, would certainly be severely felt. It is also clear, I think, that the heavy, low-grade traffics are those which bear the biggest burden relative to their value, though the American figures appear much more divergent than the British in this respect.

It is therefore clear that Messrs. Sherrington and Wood were not without justification for their statement in regard to some commodities, indeed to many important ones, though, on the average, there is more evidence to prove the contrary of their proposition. If by "very largely" they mean figures of the magnitude quoted in the present investigation, I should say that they are probably right; if, too, they mean by "the vast majority of consumption goods" those which happen to have high ratios, they are again reasonably accurate; but if the figures which we have collected are adequately representative of general conditions, it would be safer to qualify the generalisation than to offer it unconditionally. The statistics are admittedly rough and of limited value, but they apparently constitute the only material on which any statement can be made, until further concrete investigation is carried out for all commodities.[1]

Perhaps the most interesting and fundamental qualification of this criticism of the regulatory principles embodied in the Act of 1921 is that which has been suggested to me by Mr. W. T. Stephenson,[2] and which has been studied with some care in the United States.[3] It is simply that stability is theoretically not necessarily to be preferred to instability of rates, *provided* that the instability is in the *inverse* direction to that implied by the provisions of the Railways Act. From the present analysis, it would appear that the normal tendency is for railroad profits to move in close correspondence with general trade conditions, rising in booms and falling in depressions. Admitting that this tendency has been distorted in the past, and that prognostication for the

[1] Sir Josiah Stamp, in conversation, has suggested that by measuring railway freight receipts "per head of the population" some justification for the Sherrington-Wood statement can be found. But if this is related to the average income per head, as shown in figures of the distribution of income, I fail to see how this can be so, because the percentage still remains quite small. Vide Carr-Saunders and Jones: *Social Structure of Great Britain*, Chapter IX, pp. 90–104.

[2] Letter dated February 3, 1930, in reply to an argument for stability advanced in a paper by the writer to the Manchester Statistical Society, November 13, 1929.   [3] See later, pp. 109–110.

future is scarcely possible, the greater part of past experience seems to suggest a continuance of the same rule. But if this is true, the Railway Rates Tribunal will be faced with the necessity of raising rates in depressions, when profits are low, and lowering them in booms, when profits are high, in order to secure stability of net revenue within the legal limits set forth in the scheme. A most intriguing problem is thereby created.

The chief immediate stimulant to a boom is the relative fixity of costs to the entrepreneur, owing to customary and contract agreements. His rents are customary, or fixed in written contracts which cannot be revised immediately the price of the product changes; his wages costs are either union fixed for a definite contract period, or, at least, are characterised by a certain degree of customary stability; his payments on loans are at fixed rates of interest and the charges against current revenue remain constant, even though that revenue itself may vary; therefore a boom, with rising prices and gross revenues, increases the spread between the latter and gross costs, and makes industry more profitable. By adjusting the prices of the factors of production more accurately in conformity with the selling price of the finished commodity, the spread can be kept at a more even level. Stable transport rates, before the war, constituted one of the stimulants to boom conditions, of course, and it is clear that low rates would aggravate the situation.

Conversely, in a depression, stable prices on the costs side, just at a time when prices on the selling side are falling, normally act as a deadening influence, since the entrepreneur does not willingly produce with the prospect of selling later at prices lower than those which would have been required, at the date of production, to cover his costs. To increase railway rates during a depression is to add to his already increasing burdens.

As a broad proposition, anything which affects the profitability of industry affects its output and the employment which it offers, and brings in its train all the effects

of fluctuations, which have been so frequently described.[1] Since the business cycle would be stimulated to an even greater degree by the rate policy which the Railways Act seems to imply, the conclusion may be drawn that it would be undesirable to pursue it rigidly. Judged purely from the point of view of stabilisation, an autocratic mind would favour the adjustment of rates upwards in booms and downwards in depressions in very much the same way that an enlightened banking administration would manipulate its loan rates for the same purpose.[2] When it is realised, too, that the railroads are not the only industry tied down by regulation to this type of adjustment, and that outside manufacturers are coming to depend more each day on public utility sources for their power, light, and transportation, the desirability of making profit control systems more plastic, to prevent this undesirable result from accruing, becomes manifest. Adjustment inversely to the implications of the 1921 Act would appear more desirable than stability, could it successfully be carried out—which is hardly likely. It is to be noted, however, that the theory of raising rates in booms and lowering them in depressions, at the railways' expense, has had faint practical expression in the action of the Interstate Commerce Commission under the provisions of the Hoch-Smith Resolution, 1925,[3] in the United States, though this was really a one-sided affair used largely as a lever to reduce rates on agricultural

[1] In terms of the national dividend I have in mind the treatment of Professor Pigou in *The Economics of Welfare*, and in social terms that of Miss D. S. Thomas, *Social Effects of the Business Cycle*.

[2] It is not impossible that this policy may be forced on the railways by inevitable economic circumstances rather than considerations of abstract desirability. The view has been put forward by Professor C. O. Ruggles ("The Development of a Super-Power System," *Harvard Business Review*, Vol. 2, pp. 160–71), that the only way in which a given return may be secured is by regarding the accounting period over which it is calculated, not as a single year, but as covering the length of the business cycle. In conversation with Professor Ruggles, I gather that he would develop his argument to imply rate increases in booms and decreases in depressions in order to secure adequate revenues in the former to offset inevitable losses in the latter. This view is somewhat open to criticism.

[3] Sixty-Eighth Congress, Public Resolution No. 46.

products between 1925 and 1929.[1] On the whole, the practical solution most in favour is that of stabilising rates and fares over the business cycle.[2] Without the theoretical virtues of raising the rate level in booms and lowering it in depressions, a policy of stabilisation would, nevertheless, be free of the practical vices arising from reductions in booms and increases in depressions.

The view has weighty authority behind it. Much discussion was aroused, for example, in the United States during 1930 over what seemed to be implications, similar to those in the Railways Act, embodied in Section 15*a* of the Interstate Commerce Act. Section 15*a* provided that rates and fares should be fixed for various groups of American railroads in such a way as to yield a "fair return" on their "fair valuation," and that any excess should be disposed of according to certain "recapture" rules. Now the basis on which the "fair return" and the "fair valuation" are to be assessed still remains in doubt, and no definite ruling has been given from which the effects of the scheme can be forecasted.[3] The Supreme Court has said that "due" allowance should be made for "present cost of reconstruction" in the valuation, which would, if rigidly carried out, involve an element in the rate base fluctuating according to the prices of constructional materials—presumably rising in booms and falling in depressions.[4] The general impression of the Interstate Commerce Commission[5] and other public utility bodies,[6] however, seems to be that, with a fairly rigid rates base, varying only with the addition of new

[1] K. F. Burgess: "Conflict of Legislation Respecting Railroad Rates," *Harvard Business Review*, Vol. VIII, Nos. 1 and 2. Also *Railway Age*, June 14, 1930, Vol. 88, No. 24, p. 1406.

[2] In this statement, of course, secular changes are not included, and they would have to go on in any case. The argument throughout is in terms merely of the cyclical variations about trend.

[3] *St. Louis and O'Fallon R.C. v. U.S.*, 279 U.S. 461.

[4] 124 I.C.C. 31.

[5] Letter to the Senate Committee on Interstate and Foreign Commerce, January 1, 1931; mimeographed copy, p. 5, in Bureau of Railway Economics Library, Washington, D.C.

[6] Ibid., August 15, 1930; mimeographed copy, pp. 3–5, Bureau of Railway Economics Library, Washington, D.C.

capital, and a fairly fixed return, very much the same results as those suggested to underlie the British Railways Act would accrue, and rates and fares would fluctuate in an undesirable way, rising in depressions and falling in booms. This result was so seriously regarded by the Interstate Commerce Commission in 1930, that a definite attempt was made to obtain an amendment to the Interstate Commerce Act to prevent it from happening.[1]

The opportunity arose in connection with the Howell Bill,[2] introduced principally to simplify valuation and recapture. This bill was referred by the Senate Committee on Interstate and Foreign Commerce to various responsible bodies for opinions, and in the reply of the Interstate Commerce Commission, an amendment to Section 15*a* was suggested, which, after settling the principles upon which the annual allowable net income of the railways should be based, added the following clause:—

. . . The fact that the aggregate net railway operating income falls below such amount in times of economic depression or rises above it in times of economic prosperity shall not necessarily be regarded as a reason for raising or reducing rates, as the case may be; but the duty of the Commission in the exercise of sound discretion shall be to maintain so far as possible a general level of rates which *over a period of years* will produce earnings consistent with the principles, above set forth, to be observed in the determination of the fair return.

The stabilisation of railway revenues, not annually, but over a period of years sufficiently long to cover the business cycle, thus has powerful support, though the Howell Bill itself was allowed to drop for other reasons.

Apart from the disturbance arising from the general effect of revision on industry as a whole, there are other factors which depend more or less on the actual methods employed. A fundamental fact which concerns the individual trader is the rate paid by his competitor.

[1] The difficulty was said to be even "more important" than that relating to valuation (Letter, January 1, 1931).
[2] Seventy-First Congress, Second Session, S. 4005.

Indeed, it is no exaggeration to say that individuals are more concerned about the relativity of rates rather than their general level. They may be disposed to protest collectively that rates as a whole are too high, but they feel that the customer will have to bear the burden in the end. When the differentials or ratios of the rates charged to different traders competing in the same field are disturbed, however, there is much more alarm.

These differentials or ratios are a common feature of all railway systems, and seem to be theoretically inevitable under conditions of present economic organisation. The theoretical tendency finds practical expression in the numerous adjustments of rates to meet competition. Though a given rate does not cover average costs, it will be granted to meet competition, provided that the special costs of moving traffic are just cleared. From this tendency there arise a number of competitive relationships which depend on the maintenance of equal rates or fixed differentials. The competition may be either between railways themselves, or with road motors, coastwise shipping, and inland waterways.

Internal competition between railways themselves means that where two points are connected by two or more separately owned lines, the total rates, other things being equal, must be alike for each in regard to the same commodities, as otherwise the company with the lowest rate would get all the traffic. Moreover, market competition also takes place in such a way that where two companies serve the same market from different areas, they tend to put their own traders on equality with those of their competitor, even though the distance to the market be greater than that of the latter. Both these forms of competition still exist in Great Britain, despite the grouping of the companies into semi-regional monopolies.

There is inter-line competition along the divisions separating what may be called the home territories of the respective companies[1] to such an extent that special

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[1] Vide *Royal Commission on Transport, Final Report,* Cmd. 3751, 1930, p. 27, where it is stated that "the effect of grouping under the Railways Act was

provision was made in the Railways Act, 1921, for preventing it from reaching absurd proportions, as well as to stabilise existing relationships. Section 52 provided that where any two places are connected by routes belonging to two or more railway companies, and the standard rate for the carriage of merchandise by one such route is less than that by the other, the former rate should rule for all, but this should not apply to "circuitous routes," i.e. routes 30 or more per cent. longer than the shortest, unless scheduled by the Rates Tribunal before a date fixed by the Minister of Transport, or unless, subsequent to the arrangement of the schedules, the Minister of Transport approved, or, in certain circumstances, handed the matter over to the Tribunal for approval. The first schedules submitted by the companies included 48,667 routes, most of which were under 30 per cent. greater than the shortest distance, but before they were finally approved, the number was brought up almost to a hundred thousand.[1] Judgment was given on March 22, 1927, though there is nothing to prevent more from being added to the list. It is clear that competitive relationships have been established between different lines to an extent which, though possibly less than before the war, still reaches significant proportions. In addition, of course, there is every incentive to the companies to extend them as against their rivals, in so far as they increase net revenue, 20 per cent. of which is added to the standard for rate-making purposes.

That market competition exists can be proved only by detailed record of individual cases, of which there are no broad statistics. How it operates is illustrated in the case

to abolish competition between rival companies over the greater part of the country, since each of the four groups obtained a sort of territory to itself within which it possesses a monopoly; competition only remains at points which may be called frontier towns between respective territories. At such, e.g., Exeter, Birmingham, Sheffield, Leeds, and the most important cities in Scotland, an element of competition—sometimes acute—remains, especially for London traffic." The Commission, in its *Report* (pp. 28 and 152), recommended the abolition of this competition and the substitution of pooling arrangements.

[1] *Fourth, Fifth, and Sixth Annual Reports of the Railway Rates Tribunal,* pp. 8, 6–8, and 6 respectively.

efficiency of B and a resulting extension of total sales, can be left out of account. Nevertheless, whilst it is true that competitive market rates arise only with the existence of competition, there are still survivals of old rates in the present structure. Special provision was made for maintaining old exceptional rates after the "appointed day,"[1] and in them would be many which were the result of the old more severely competitive regime amongst the companies which later constituted each of the "Big Four." Exactly how far this is true it is not possible to say.

Competition between railways and other means of transport has not seemed to be stifled to the same extent that inter-railway competition is now commonly supposed to be, and it is widely known that there are a great number of rates adjusted to meet it. There is less need, therefore, to labour the point. It was thought that the new standard charges established by the Act of 1921 would restrict their number, but this hope is generally admitted to be a complete failure. Rates and fares cannot be crystallised, and to attempt this at a time when the general level of prices was anticipated to fall, thus stimulating motor competition, was both futile and short-sighted. It is easy to speak after the event, of course, but there were plenty of signs (admitted by the nature of other legislation, such as that concerning housing) which would have indicated to the framers of the Act the direction in which prices would be likely to move. On January 1, 1928, when the new charges first came into operation, there were about 5,000,000 exceptional rates in existence, but by October 1929 it was estimated that their number had increased to 6,000,000,[2] and it is

[1] Sections 32 and 36 of the Railways Act. The procedure was for the companies to work in close connection with the Traders' Co-ordinating Committee in the solution of this practical problem, and very good work was done in meeting difficulties in a reasonable spirit (vide *Guide to Traders on Exceptional Rates and Their Continuance after the Appointed Day*, by D. H. J. Hartley, Honorary Secretary to the Traders' Co-ordinating Committee). When the Act came into operation on January 1, 1928, there were about 5,000,000 exceptional rates in operation, many of which must have been based on the relationships here described.

[2] *Jnl. Inst. Transpt.*, Vol. II, No. 2, p. 93; *Rate-Making in Practice*, by J. Pike.

certain that the present figure is much higher still. Further evidence of the same tendency is available in the percentage of traffic moving under standard charges during representative weeks in March 1928 and 1930. As regards tonnage, in the former it was 33·34 and in the latter 23·48. In terms of receipts the figures are 49·62 and 40·02.[1] The percentages are affected by changes in the nature of the traffic at the two dates, to be sure, but, together with the other evidence, they seem to suggest a tendency for the standard rates to decrease in importance.

These, then, are the chief competitive relationships which are so much the concern of the trader as an individual rather than as a member of a corporate body, and the delicate adjustment of these ratios may be disturbed by different methods of revision. Unless re-establishment takes place, other things being equal, individual traders may suffer, though what one man loses will be equally offset by what another gains. The chief methods in common use for general increases or decreases of rates are the "flat sum per ton," the "flat sum per ton-mile," and the "percentage of total rate" systems.[2] These may be used either singly or in combination, but if we examine their respective effects, the cumulative result of their combination will only depend on summing the tendencies of the constituents of the combination.

Abstractly, an increase or decrease of a fixed sum per ton originating cannot effect competitive differentials, because what concerns the individual trader is the absolute amount of the rate compared with his competitors. To make a fixed addition to all competitors' rates maintains the same relationship as before. Whilst this is true, the greater *relative* burden of an increase falls on the trader whose goods travel only a short distance,

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[1] *Annual Railway Returns*, 1930, p. 11.

[2] A summary of the various upward revisions in 1919 and 1920 is contained in the *First Annual Report of the Railway Rates Tribunal* for the Year 1922, pp. 4–7. As a rule the composite method, including a percentage and a flat sum, was used, with a provision for a maximum total increase per ton. The decreases after 1923 were often by straight percentages.

and vice versa. Complaint was made to the Railway Rates
Tribunal in 1923 by the Mining Association of Great
Britain against the London, Midland, and Scottish
Company on this score.[1] The Association, representing
the colliery industry of Great Britain, is largely interested
in the carriage by rail of coal, coke, and patent fuel, and
applied for the abolition of the flat charge of 2d. per
ton then in operation. It was urged that coal was a
raw material of which a very large tonnage was carried
for short distances. The conveyance charge per mile was,
without the flat rate addition, higher than for coal or
other merchandise carried for longer distances, and the
flat rate addition increased the burden. This was a case
of the kind where the relativity of the burden bore hardly
on the short-distance traffic, though the absolute amount,
of course, might have remained relatively constant, so
as not to disturb competitive relationships to the same
degree.

On the other hand, an increase of a flat sum per ton-
mile bears more heavily on long-distance traffic, and
vice versa, therefore disturbing the absolute amount of
one rate compared with another. Competitive relation-
ships are disrupted in such a way that transfer of custom
from a trader to a competitor may take place, though the
railway industry as a whole will not suffer merely from
the transfer, gaining at one source of traffic what it loses
at another. A percentage increase or decrease of a tariff
based essentially on mileage has a similar effect, where
the trade of one manufacturer has come to depend on the
existence of the fixed differential represented by the
difference of rate for the distance of his plant from a
market compared with the rate for the nearer distance of
his competitor's plant from the same market. For example,
there were many complaints in the United States relative
to the disturbance of relationships between producing

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[1] *Second Annual Report of the Railway Rates Tribunal*, p. 17. Similar applica-
tions were brought against the other companies, and the colliery industry was
not alone in its complaints, being seconded by coke and by-product and iron
and steel associations.

and consuming districts due to the manner in which rates were increased in 1920, and there was a common belief that traffic had become localised. One representative witness testified before the Interstate Commerce Commission in 1922[1] that, "whilst his trade in territory within a radius of 100 miles declined 16 per cent. in 1921, as compared with 1920, the volume of his business in territory distant from 500 to 800 miles declined from 30 to 50 per cent." There are no such comparable distances in Great Britain, and the percentage changes arising from industrial fluctuations are not likely to be great; but it has already been shown that the British colliery industry feels even a twopenny flat increase per ton to be of importance, so that divergences of pennies and halfpennies seems to count in some industries. It appears that this is unlikely to be the case in many, however, because rates are so small a proportion of total costs, and excessive transportation charges count for relatively little.

General percentage increases or decreases, when applied to rates already equalised by the force of competition, do not disturb competitive relationships, because the same absolute sum is added to, or subtracted from, the rates of all competitors, and though all change, they change equally. The effect of general percentage increases or decreases of distance tariffs has already been described when dealing with flat sum per ton-mile revisions, and similar effects would follow where competition between traders depends on a fixed differential not arising out of differences of distance from the common market.

From this description of the effects of general revisions, it is clear that where competitive relationships are disturbed, other things being equal, one company would tend to gain at the expense of another, and one trader at the expense of another. It is possible for one trader to gain at the expense of another without the railway company losing. Such a case would arise in circumstances similar to those described on this page as occurring in

[1] 68 I.C.C. 705.

the United States, provided that the trade's customers were all connected by the same railway. Then trader A's loss would be trader B's gain, though the company would merely carry B's instead of A's goods. The local man would gain; the distant man would lose. This, however, is hardly likely to be as common as those instances where the railway companies would be tied to the fortunes of their customers.

In order to meet circumstances such as these, adjustments would have to be made in order to preserve inter-rail competition, so that there would not normally be any disturbance of competitive relationships, though the case similar to that cited for the United States would certainly mean redistribution of trade among the manufacturers.

Whilst absolute fixity of the differentials between two competitors, it is true, maintains stability of their competitive relationships, provided always that other things remain equal, actual conditions are more complicated. One interesting, if somewhat delicate, effect, for example, follows from such fixity. It tends, indeed, to disrupt the relationship. It is well known, of course, that prices move cyclically, and that agricultural prices are no exception to the general rule. Suppose that the unit price of an agricultural product in a given market is £1·00 at a given date A, and that at some subsequent date B it increases to £1·10. At the first date suppose also that there are two producing areas, X and Y, with originating-point prices of £0·80 and £0·60 respectively. Market competition will theoretically cause the former to bear a rate of £0·20 and the latter a rate of £0·40 to the common market. The actual rate may not consciously be constructed by the railway company, of course. It may be more the cause than the effect of the competition of the two areas in the same market. Thus the rate may be on a pure mileage basis, but conditions in the two areas may be such that the one with the higher rate may still be able to compete with the one bearing the lower rate, owing to favourable growing circumstances. At any time, however, a condition of stable inter-competitive relation-

ship may be conceived as being dependent in part on the railway differential, whether the differential is the direct conscious result of manipulation by the railways or whether the producers themselves have become adjusted to the rate. At the second date, other things being equal, the unit prices obtainable in the two areas will be £0·90 and £0·70 respectively, these being the figures left after deducting the railway rates of £0·20 and £0·40 from the new market price of £1·10. It will be observed that the absolute amount of the rate differential in favour of area X over area Y remains constant, but what can be said of the incentive to production in the two areas? In area X, the originating-point price which can be obtained has increased by 12½ per cent., i.e. $\frac{1}{8} \times$ 100; in area Y it has increased by 16⅔ per cent., i.e. $\frac{1}{6} \times$ 100. Unless costs have increased appropriately in each area, the increase in the originating-point price level favours production in area Y, because the profit incentive has increased relative to that in area X. Since it is scarcely likely that the absolute increase in unit costs will be appropriate in each area, the effect of price changes, even with a fixed differential, is to disrupt the real competitive relationship. In order to obtain some stability, there should presumably be a change in the differentials so as to maintain constancy of the profit incentive rather than constancy of the absolute differential. To suggest that the railways attempt to make such arrangements and adjustments would, however, require them to interfere in the management of individual businesses and to carry the principle of charging what the traffic will bear to a high degree of detail. In the often quoted words of Commissioner Lane, of the I.C.C., discriminatory practice of this type would—

... give to the carrier the right to measure the amount of profit which the shipper may make, and fix its rates upon the traffic manager's judgment as to what profit he will be permitted. (It would enable) the railroad to enter the books of every enterprise and raise or lower rates without respect to its own earnings, but solely with respect to the earnings of those whose traffic it carries.

It is therefore scarcely to be recommended without reserve, though it would certainly prevent stability of absolute differentials from causing production to be stimulated in certain areas and depressed in others when price changes take place in the market to which they minister. This type of case, however, illustrates quite clearly the limitations of the arguments already advanced with regard to maintaining stable differentials, since it would be more common to have price changes taking place when rates and fares would be changed under the Railways Act than to have rates and fares alone varying. Regulation would therefore have to take account of all the varying elements in the inter-competitive situation, and would have to strike a balance between their conflicting tendencies. This would be a task of no little delicacy, more easily expressed as a theoretical proposition than carried out in practice.

(3)

A second criticism of the Act—if criticism it can be called—is that the degree of revision is not likely at any time to be the same for each company. It has already been shown that equality of fluctuation has never been manifested in the past, and we may assume that it is unlikely to happen in the future. From this it follows that revisions, if they take place, are likely to be greater for some companies than others, and that, in so far as the public has to bear the burden of altered rates, some producers must expect greater changes than others, according to the company on which they are dependent. It needs to be recalled, of course, that the net revenue fluctuations must be related to gross revenue before any idea of the relative degree of rate and fare adjustment can be secured, and that those companies with the greatest absolute or relative fluctuation of net will not necessarily require the greatest rate and fare adjustment. Even when this is recognised, however, there still remain good

reasons for supposing that the degree of adjustment will have to be different in regard to different companies.

It can be argued, in reply, that the degree of fluctuation, to which each company is subject, is not of significance, because, in cyclical movements at least, there is compensation for increases in decreases, and that what matters is the average general level of rates and fares, not the fluctuation about the average. What is lost in some years is returned in others. Although this argument is specious, in some respects, to the abstract mind, it still remains true that alterations, other things being equal, may be disturbing, and that the greater their magnitude, the greater the disturbance. The average gradient of a smooth road and a cobbled road may be the same over a distance of ten miles, but this does not console the cyclist who has to push his hard narrow wheels over the latter.

The four companies have been compulsorily constituted by Act of Parliament, and any consequences arising from the way in which they have been formed are, to some extent, the work of Parliament. Assuming that the present regulatory system is retained, the obvious way in which relative stability of rates and fares can be established as between the four companies is by complete amalgamation. In statistical terms, there would be an off-setting tendency, in such a way that the coefficient of variation of the profits of the companies taken together would be less than the average of the coefficients of variation of the profits made by the four companies taken separately. An average always smooths out random fluctuations in its constituents. This is not to urge further amalgamation, however. It would be rash to assert that the benefits arising from greater stability of net revenue are sufficiently large to warrant the view that an extension of the principle of amalgamation is desirable, because they are so small as to amount to little in the general argument for or against it. Nevertheless, in any discussion of the problem, this factor would not have to be lost sight of.

The long-period trend of traffic conditions is of even greater importance than cyclical movement. For example, the four big companies have been losing traffic each to a different extent, because they depend in varying degrees on the traffic in which motor competition is keenest, etc. They will not willingly carry any traffic which does not meet at least its special costs of movement and make a contribution, however small, towards the fixed costs, but the rate will always be manipulated in a downwards direction to that limit rather than that the trade be lost. In this case the deficiency on fixed costs has to be made up on the other traffic with an inelastic demand. If there is but little of this type relative to the whole, then the increase of rates on it will have to be higher than if there were a great deal. Therefore, in so far as the Act of 1921 is responsible for creating companies differently dependent on short-distance and high-valued traffic, it is responsible for any consequences arising from the difference in the relation between rates on non-competitive traffic and on competitive traffic which tends to follow. The consequences of the tendency have not yet worked themselves out, as the sphere of motor competition is still indefinite.

Even apart from the railroad relationship, any changes in industry, such as the decline in the South Wales coal industry, will have a similar effect on rate structure, being different according to the company affected, and the Railways Act will be blamed for thrusting a particular trade on that company. Amalgamation is a measure of insurance against fluctuations of this type, as has already been suggested. Indeed, the present amalgamations afford good proof of this. Had it not been for the stability given by combination, there is no doubt that some of the pre-war lines would have been in a very difficult position. How much the old North Eastern Railway has gained from its combination with the other constituents of the present London and North Eastern during recent bad times in the coal industry, or whether the old South Wales coal lines could have met their debenture claims— these would make interesting problems.

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